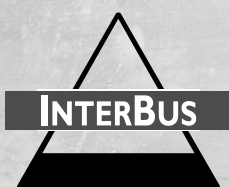
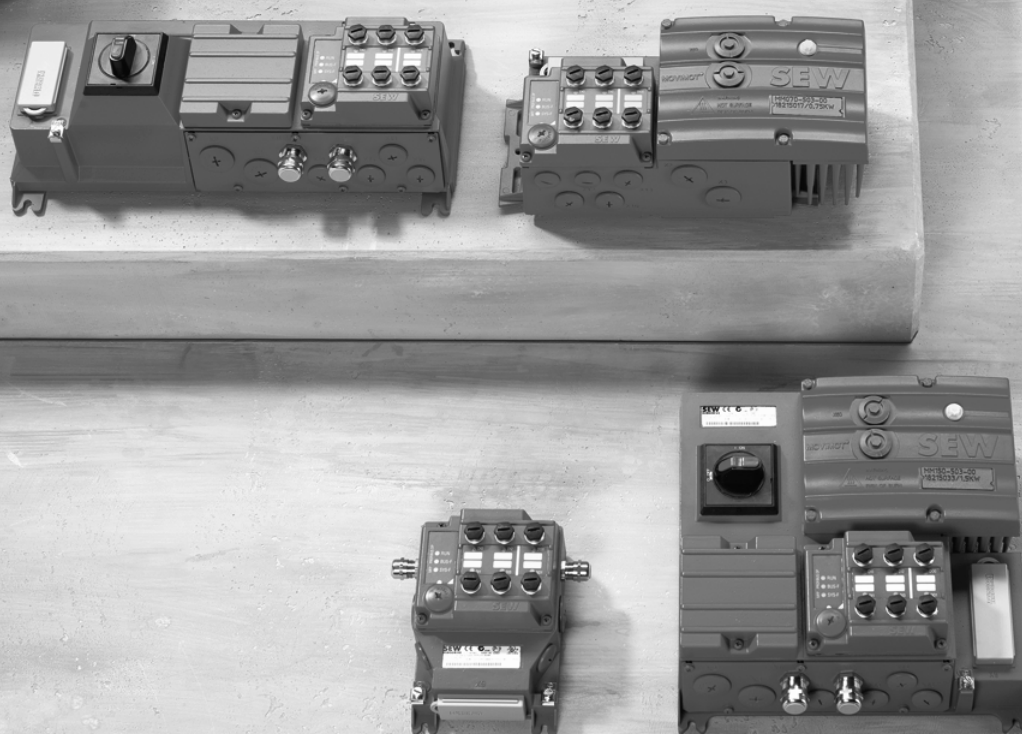




SEW
EURODRIVE



Drive System for Decentralized Installation InterBus Interfaces, Field Distributors

Edition 11/2008

16727215 / EN

Manual





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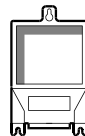
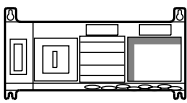
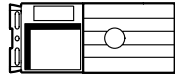
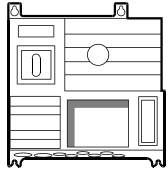


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1 Valid Components

This manual applies to the following products:

Connection module ..Z.1. with fieldbus interface				
	4 x I / 2 x O (terminals)	4 x I / 2 x O (M12)	6 x I (M12)	
INTERBUS (copper)	MFI21A/Z11A	MFI22A/Z11A	MFI32A/Z11A	
INTERBUS (FO)	-	MFI23F/Z11A	MFI33F/Z11A	
INTERBUS (copper) with integrated minicontroller	MQI21A/Z11A	MQI22A/Z11A	MQI32A/Z11A	
Field distributor ..Z.3. with fieldbus interface				
	no I/O	4 x I / 2 x O (M12)	6 x I (M12)	
INTERBUS (copper)	MFI21A/Z13A	MFI22A/Z13A	MFI32A/Z13A	
INTERBUS (FO)	-	MFI23F/Z13A	MFI33F/Z13A	
INTERBUS (copper) with integrated minicontroller	MQI21A/Z13A	MQI22A/Z13A	MQI32A/Z13A	
Field distributor ..Z.6. with fieldbus interface				
	4 x I / 2 x O (terminals)	4 x I / 2 x O (M12)	6 x I (M12)	
INTERBUS (copper)	MFI21A/Z16F/AF0	MFI22A/Z16F/AF0	MFI32A/Z16F/AF0	
INTERBUS (FO)	-	MFI23F/Z16F/AF0	MFI33F/Z16F/AF0	
INTERBUS (copper) with integrated minicontroller	MQI21A/Z16F/AF0	MQI22A/Z16F/AF0	MQI32A/Z16F/AF0	
Field distributor ..Z.7. with fieldbus interface				
	4 x I / 2 x O (terminals)	4 x I / 2 x O (M12)	6 x I (M12)	
INTERBUS (copper)	MFI21A/MM../Z17F.	MFI22A/MM../Z17F.	MFI32A/MM../Z17F.	
INTERBUS (FO)	-	MFI23F/MM../Z17F.	MFI33F/MM../Z17F.	
INTERBUS (copper) with integrated minicontroller	MQI21A/MM../Z17F.	MQI22A/MM../Z17F.	MQI32A/MM../Z17F.	
Field distributor ..Z.8. with fieldbus interface				
	4 x I / 2 x O (terminals)	4 x I / 2 x O (M12)	6 x I (M12)	
INTERBUS (copper)	MFI21A/MM../Z18F./AF0	MFI22A/MM../Z18F./AF0	MFI32A/MM../Z18F./AF0	
INTERBUS (FO)	-	MFI23F/MM../Z18F./AF0	MFI33F/MM../Z18F./AF0	
INTERBUS (copper) with integrated minicontroller	MQI21A/MM../Z18F./AF0	MQI22A/MM../Z18F./AF0	MQI32A/MM../Z18F./AF0	



2 General Information

2.1 How to use the operating instructions

The operating instructions are an integral part of the product and contain important information for operation and service. The operating instructions are written for all employees who assemble, install, startup, and service this product.

The operating instructions must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. Consult SEW-EURODRIVE if you have any questions or if you require further information.

2.2 Structure of the safety notes

The safety notes in these operating instructions are structured as follows:

Symbol	SIGNAL WORD
	Nature and source of hazard. Possible consequence(s) if disregarded. • Measure(s) to prevent the hazard.

Symbol	Signal word	Meaning	Consequences if disregarded
Example: General danger	DANGER	Imminent danger	Severe or fatal injuries
	WARNING	Possible hazardous situation	Severe or fatal injuries
 Specific danger, e.g. electric shock	CAUTION	Possible hazardous situation	Minor injuries
	NOTICE	Potential damage to property.	Damage to the drive system or its environment
	TIP	Useful information or tip. Simplifies handling of the drive system.	



2.3 *Rights to claim under limited warranty*

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the operating instructions and this manual. Consequently, read the operating instructions and this manual before you start working with the unit!

2.4 *Exclusion of liability*

It is essential that you observe the operating instructions to ensure safe operation and to achieve the specified product characteristics and performance features of the fieldbus interfaces, field distributors and MOVIMOT® MM..D inverters. SEW-EURODRIVE does not assume liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

2.5 *Copyright*

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Copyright law prohibits the unauthorized duplication, modification, distribution, and use of this document, in whole or in part.



3 Safety Notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and observed. Make sure that persons responsible for the plant and its operation, as well as persons who work independently on the unit, have read through the operating instructions and manual carefully and understood them. If you are unclear about any of the information in this documentation, please contact SEW-EURODRIVE.

3.1 General

Never install or start up damaged products. Submit a complaint to the shipping company immediately in the event of damage.

During operation, MOVIMOT® drives can have live, bare and movable or rotating parts as well as hot surfaces, depending on their enclosure.

Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to property. Consult the documentation for further information.

3.2 Target group

Only qualified personnel is authorized to install, startup or service the units or correct unit faults (observing IEC 60364 and CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE 0110 as well as national accident prevention guidelines).

Qualified personnel in the context of these basic safety notes are: All persons familiar with installation, assembly, startup and operation of the product who possess the necessary qualifications.

Any activities regarding transportation, storage, operation, and disposal must be carried out by persons who have been instructed appropriately.

3.3 Designated use

The field distributors and fieldbus interfaces are intended for industrial systems. They comply with the applicable standards and regulations and meet the requirements of the Low Voltage Directive 73/23/EEC.

You must observe the technical data and information on the connection requirements as provided on the nameplate and in the documentation.

Do not start up the unit (operate in the designated fashion) until you have established that the machine complies with the EMC Directive 2004/108/EC and that the end product categorically conforms to Machinery Directive 98/37/EC (with reference to EN 60204).

MOVIMOT® inverters comply with the regulations of the Low Voltage Directive 2006/95/EC. The standards given in the declaration of conformity are used for the MOVIMOT® inverter.



3.3.1 Safety functions

The field distributors, fieldbus interfaces and MOVIMOT® inverters may not perform safety functions unless these functions are described and expressly permitted.

If MOVIMOT® inverters are used in safe applications, you must observe the supplemental documentation "Safe Disconnection for MOVIMOT®". Use only those components in safety applications that were explicitly designed and delivered for this purpose by SEW-EURODRIVE.

3.3.2 Hoist applications

When using MOVIMOT® inverters in hoist applications, you must observe the special configuration and settings for hoist applications specified in the operating instructions for MOVIMOT®.

MOVIMOT® inverters are not designed for use as a safety device in hoist applications.

3.4 Other applicable documentation

Note also the following documentation:

- "DR/DV/DT/DTE/DVE AC Motors, CT/CV Asynchronous Servomotors" operating instructions
- "AC Motors DRS/DRE/DRP" operating instructions
- "MOVIMOT® MM..C" and "MOVIMOT® MM..D" operating instructions
- "IPOS^{plus}® Positioning and Sequence Control" manual

3.5 Transportation, storage

You must observe the notes on transportation, storage and proper handling. Comply with the requirements for climatic conditions stated in section "Technical Data". Tighten installed eyebolts securely. They are designed for the weight of the MOVIMOT® drive. Do not attach any additional loads. Use suitable, sufficiently rated handling equipment (e.g. rope guides) if required.

3.6 Installation

The units must be installed and cooled according to the regulations and specifications in the corresponding documentation.

Protect the field distributors, fieldbus interfaces and MOVIMOT® inverters from improper strain.

The following applications are prohibited unless the unit is explicitly designed for such use:

- Use in potentially explosive atmospheres.
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in non-stationary applications with strong mechanical oscillation and impact loads.



3.7 Electrical Connection

Observe the applicable national accident prevention guidelines when working on live field distributors, fieldbus interfaces and MOVIMOT® inverters (e.g. BGV A3).

Electrical installation is to be carried out in compliance with pertinent regulations (e.g. cable cross sections, fusing, protective conductor connection). For any additional information, refer to the applicable documentation.

You will find notes on EMC-compliant installation, such as shielding, grounding, arrangement of filters and routing of lines, in the documentation of the MOVIMOT® inverter. The manufacturer of the machine or system is responsible for maintaining the limits established by the EMC legislation.

Protective measures and protection devices must comply with the regulations in force (e.g. EN 60204 or EN 61800-5-1).

3.8 Safe disconnection

The field distributors and fieldbus interfaces meet all requirements for safe disconnection of power and electronics connections in accordance with EN 61800-5-1. All connected circuits must also satisfy the requirements for safe disconnection.

3.9 Operation

Systems with integrated field distributors, fieldbus interfaces and MOVIMOT® inverters must be equipped with additional monitoring and protection devices according to the applicable safety guidelines, such as the law governing technical equipment, accident prevention regulations, etc. Additional protective measures may be necessary for applications with increased potential risk.

Do not touch live components or power connections immediately after disconnecting the MOVIMOT® inverter, the field distributor (if installed) or the bus module (if installed) from the supply voltage because there may still be some charged capacitors. Wait at least for 1 minute after having switched off the supply voltage.

As soon as supply voltage is present at the field distributor, the fieldbus interfaces and the MOVIMOT® inverter, the housings must be closed, which means that:

- The MOVIMOT® inverter must be screwed on.
- The connection box cover of the field distributor (if installed) and the fieldbus interface (if installed) must be screwed on.
- The connector of the hybrid cable (if installed) must be connected and screwed on.

Important: The maintenance switch of the field distributor (if installed) only disconnects the connected MOVIMOT® drive or motor from the power supply system. The terminals of the field distributor remain connected to the supply voltage even after the maintenance switch is activated.

The fact that the status LED and other display elements are no longer illuminated does not indicate that the unit has been disconnected from the power supply and no longer carries any voltage.

Mechanical blocking or internal safety functions of the unit can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically. If, for safety reasons, this is not permitted for the driven machine, disconnect the unit from the supply system before correcting the error.

Caution: Danger of burns: The surface temperature of the MOVIMOT® drive and of ex-

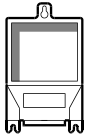


ternal options, e.g. the heat sink of the braking resistor, can exceed 60 °C during operation!



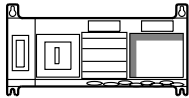
3.10 Supplementary safety notes for field distributors

3.10.1 MFZ.3. field distributor



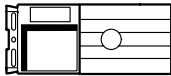
- Disconnect the unit from the power supply system before removing the fieldbus interface or the motor connector. Dangerous voltages may still be present for up to 1 minute after disconnection from the power supply.
- The fieldbus interface and the connector of the hybrid cable must be connected to the field distributor and fastened during operation.

3.10.2 MFZ.6. field distributor



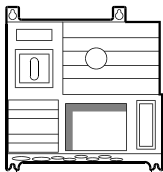
- Before removing the connection box cover for the power supply connection, disconnect the unit from the power supply system. Dangerous voltages may still be present for up to 1 minute after disconnection from the power supply.
- Important: The switch only disconnects the MOVIMOT® inverter from the power supply system. The terminals of the field distributor are still connected to the power supply after activating the maintenance switch.
- During operation, the connection box cover for the power supply connection and the connector of the hybrid cable must be connected to the field distributor and fastened.

3.10.3 MFZ.7. field distributor



- Before removing the MOVIMOT® inverter, disconnect the unit from the power supply system. Dangerous voltages may still be present for up to 1 minute after disconnection from the power supply.
- The MOVIMOT® inverter and the connector of the hybrid cable must be connected to the field distributor and fastened during operation.

3.10.4 MFZ.8. field distributor



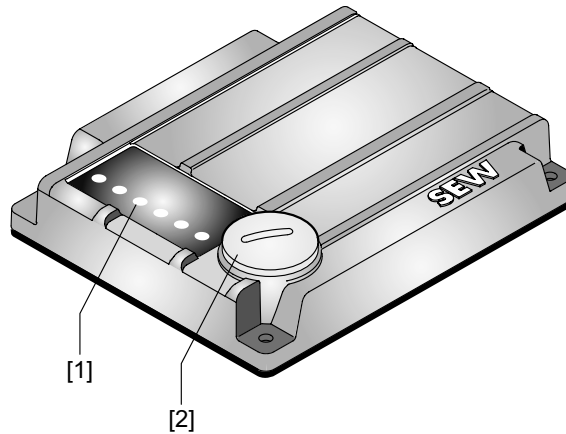
- Disconnect the unit from the power supply system before removing the connection box cover for the power supply connection or the MOVIMOT® inverter. Dangerous voltages may still be present for up to 1 minute after disconnection from the power supply.
- Important: The maintenance switch only disconnects the connected motor from the power supply system. The terminals of the field distributor are still connected to the power supply after activating the maintenance switch.
- The connection box cover for the power supply connection, the MOVIMOT® inverter and the connector of the hybrid cable must be connected to the field distributor and fastened during operation.



4 Unit Design

4.1 Fieldbus interfaces

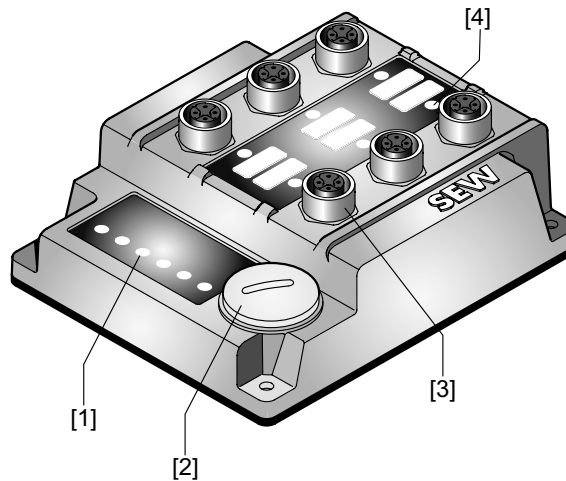
4.1.1 MF.21/MQ.21 fieldbus interface



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- [1] Diagnostic LEDs
- [2] Diagnostic interface (below screw fitting)

4.1.2 MF.22, MF.32, MQ.22, MQ.32 fieldbus interface

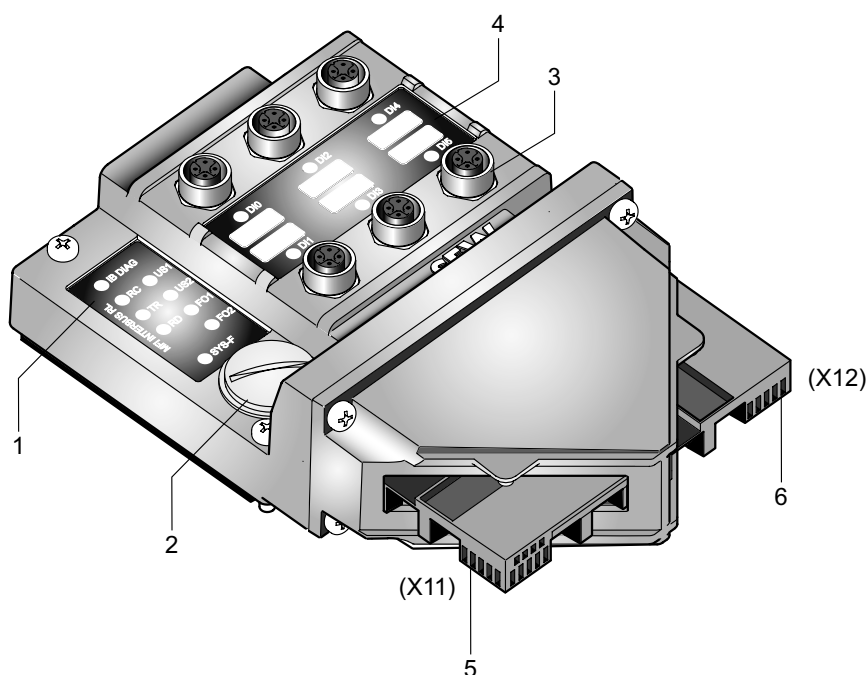


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- [1] Diagnostic LEDs
- [2] Diagnostic interface (below screw fitting)
- [3] M12 connection sockets
- [4] Status LED



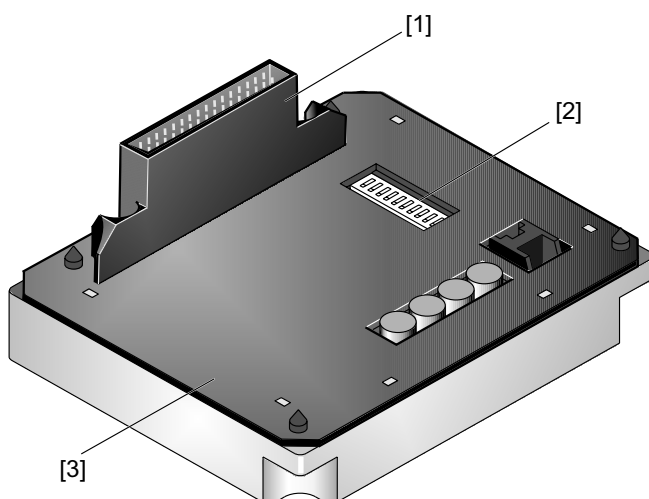
4.1.3 MFI23, MFI33 fieldbus interface with rugged line connector (INTERBUS only)



1397550603

- [1] Diagnostic LEDs
- [2] Diagnostic interface (below screw fitting)
- [3] M12 connection sockets
- [4] Status LED
- [5] Rugged line connection "Remote IN" (incoming remote bus and DC 24 V supply)
- [6] Rugged line connection "Remote OUT" (outgoing remote bus and DC 24 V supply)

4.1.4 Underside of interface unit (all MF../MQ.. interfaces)

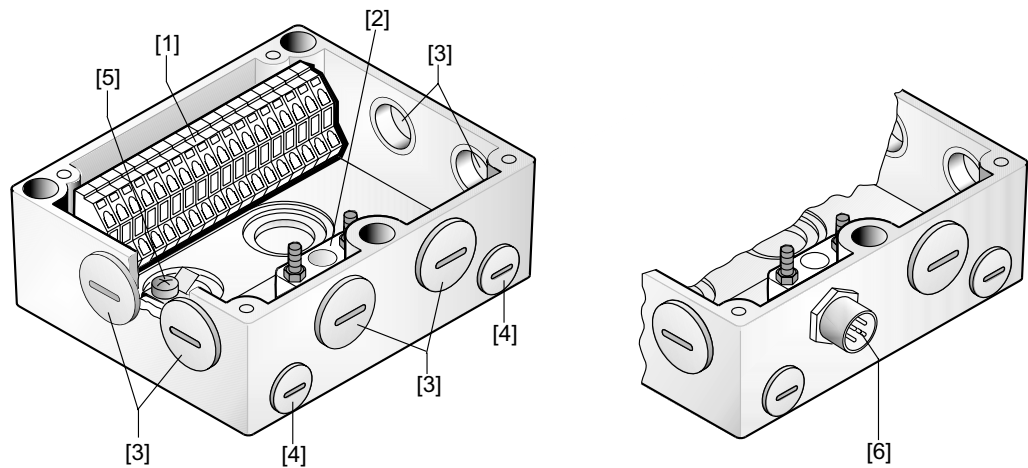


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- [1] Connection to connection module
- [2] DIP switches (dependent on variant)
- [3] Seal



4.1.5 Unit structure of MFZ.. connection module



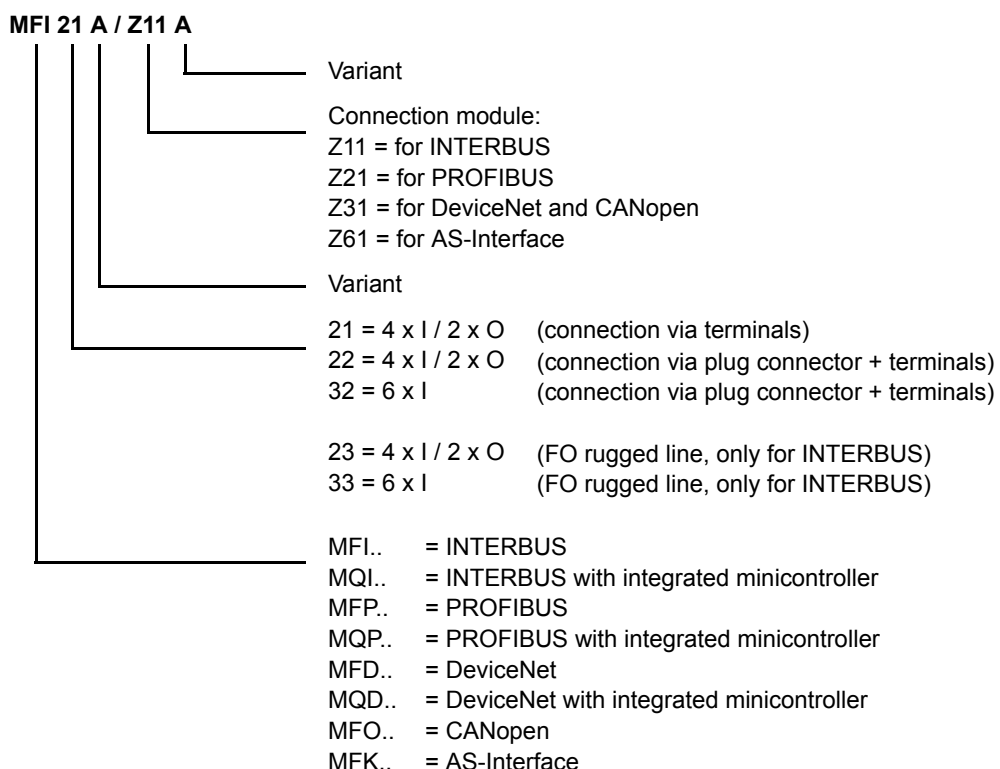
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- [1] Terminal strip (X20)
- [2] Isolated terminal block for 24 V through-wiring
(Caution: do not use for shielding.)
- [3] M20 cable gland
- [4] M12 cable gland
- [5] Grounding terminal
- [6] For DeviceNet and CANopen: Micro-style connector/M12 connector (X11)
For AS-Interface: AS-interface M12 connector (X11)

The scope of delivery includes 2 EMC cable glands.



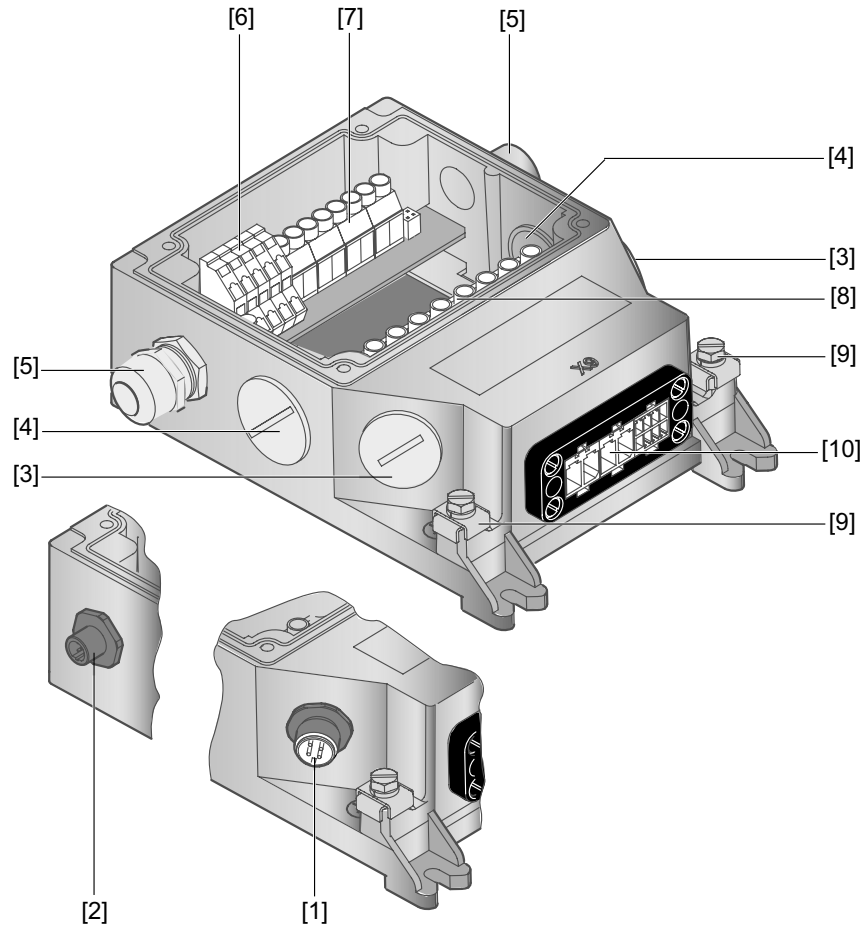
4.2 INTERBUS interfaces – unit designation





4.3 Field distributors

4.3.1 MF../Z.3., MQ../Z.3. field distributors

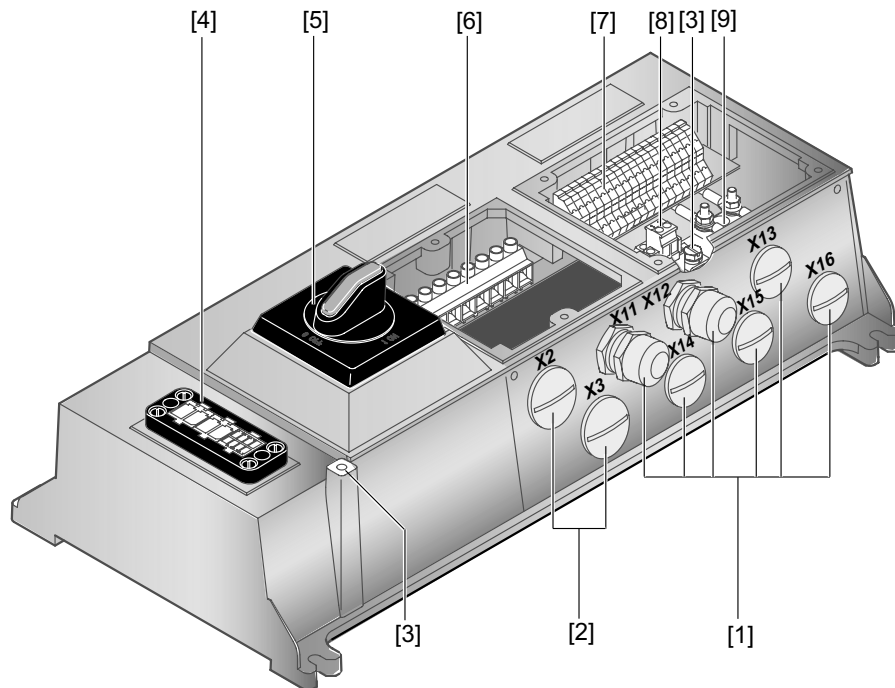


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- [1] For DeviceNet and CANopen: Micro-style connector/M12 connector (X11)
- [2] For AS-Interface: AS-interface M12 connector (X11)
- [3] 2 x M20 x 1.5
- [4] 2 x M25 x 1.5
- [5] 2 x M16 x 1.5 (scope of delivery includes two EMC cable glands)
- [6] Terminals for fieldbus connection (X20)
- [7] Terminals for 24 V connection (X21)
- [8] Terminals for power supply and PE connection (X1)
- [9] Equipotential bonding connection
- [10] Hybrid cable connection; connection to MOVIMOT® (X9)

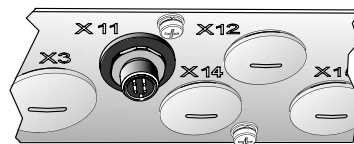


4.3.2 MF../Z.6., MQ../Z.6. field distributors



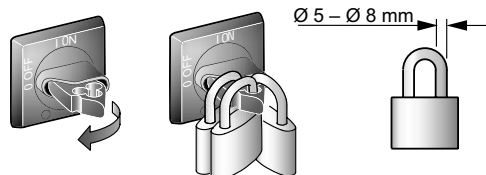
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- [1] 6 x M20 x 1.5 (scope of delivery includes two EMC cable glands)
For DeviceNet and CANopen: Micro-style connector/M12 connector (X11), see the following figure:
For AS-Interface: AS-Interface M12 connector (X11), see following figure:



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- [2] 2 x M25 x 1.5
[3] Equipotential bonding connection
[4] Hybrid cable connection; connection to MOVIMOT® inverter (X9)
[5] Maintenance switch **with line protection** (triple lock, color: black/red)
Only for MFZ26J: Optional integrated feedback for position of the maintenance switch.
The feedback is evaluated at digital input DI0 (section "Connection of MF../MQ../ fieldbus interface inputs/outputs (I/O)" (see page 64).

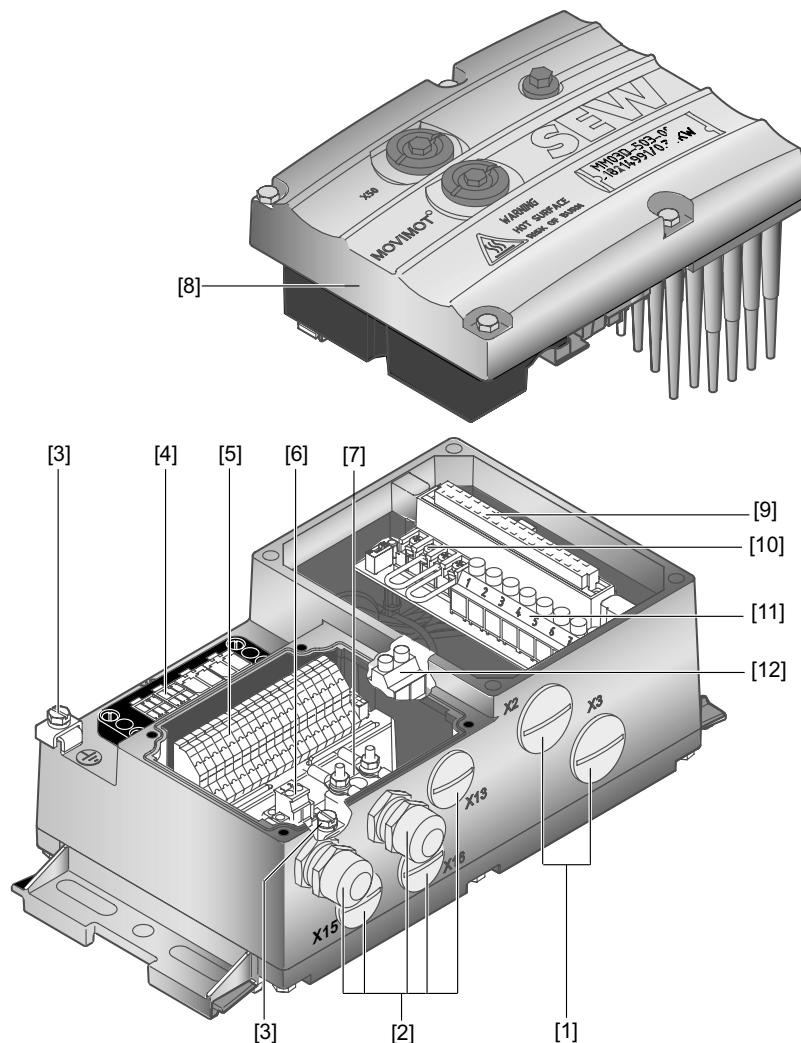


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- [6] Terminals for power supply and PE connection (X1)
[7] Terminals for bus, sensor, actuator, 24 V connection (X29)
[8] Pluggable terminal "Safety Power" for 24 V MOVIMOT® supply (X40)
[9] Terminal block for 24 V through-wiring (X29), internal connection to 24 V on X20

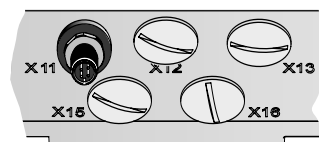


4.3.3 MF../MM../Z.7., MQ../MM../Z.7. field distributors



1136447627

- [1] 2 x M25 x 1.5 cable glands
 - [2] 5 x M20 x 1.5 cable gland (scope of delivery includes two EMC cable glands)
- For DeviceNet and CANopen: Micro-style connector/M12 connector (X11), see the following figure:
 For AS-Interface: AS-Interface M12 connector (X11), see following figure:

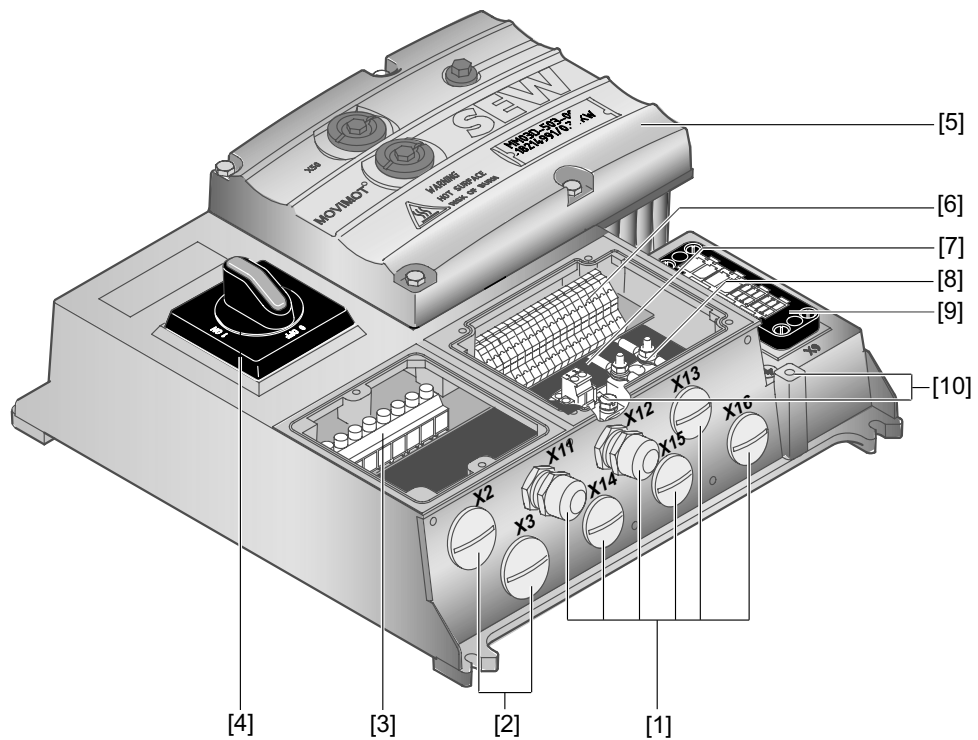


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- [3] Equipotential bonding connection
- [4] Hybrid cable connection; connection to AC motor (X9)
- [5] Terminals for bus, sensor, actuator, 24 V connection (X29)
- [6] Pluggable terminal "Safety Power" for 24 V MOVIMOT® supply (X40)
- [7] Terminal block for 24 V through-wiring (X29), internal connection to 24 V on X20
- [8] MOVIMOT® inverter
- [9] Connection to the MOVIMOT® inverter
- [10] Terminals for enabling the direction of rotation
- [11] Terminals for power supply and PE connection (X1)
- [12] Terminal for integrated brake resistor



4.3.4 MF../MM../Z.8., MQ../MM../Z.8. field distributors



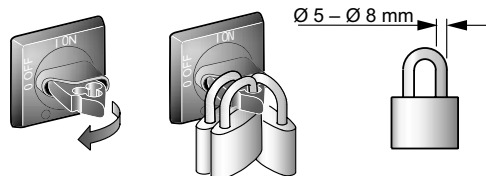
1136479371

- [1] 6 x M20 x 1.5 cable gland (scope of delivery includes two EMC cable glands)
For DeviceNet and CANopen: Micro-style connector/M12 connector (X11), see the following figure:
For AS-Interface: AS-Interface M12 connector (X11), see following figure:



1136438155

- [2] 2 x M25 x 1.5 cable gland
[3] Terminals for power supply and PE connection (X1)
[4] Maintenance switch (triple lock, color: black/red)
Only for MFPZ28J: Optional integrated feedback for position of the maintenance switch. The feedback is evaluated at digital input DI0 (section "Connection of MF../MQ.. fieldbus interface inputs/outputs (I/O)" (see page 64).



1136352395

- [5] MOVIMOT® inverter
[6] Terminals for bus, sensor, actuator, 24 V connection (X29)
[7] Pluggable terminal "Safety Power" for 24 V MOVIMOT® supply (X40)
[8] Terminal block for 24 V through-wiring (X29), internal connection to 24 V on X20
[9] Hybrid cable connection; connection to AC motor (X9)
[10] Equipotential bonding connection



4.4 INTERBUS field distributors – unit designation

4.4.1 Example: MF../Z.3., MQ../Z.3.

MFI21A/Z13A

Connection module

Z13 = for INTERBUS
 Z23 = for PROFIBUS
 Z33 = For DeviceNet and CANopen
 Z63 = For AS-Interface

Fieldbus interface

MFI../MQI.. = INTERBUS
 MFP../MQP.. = PROFIBUS
 MFD../MQD.. = DeviceNet
 MFO.. = CANopen
 MFK.. = AS-Interface

4.4.2 Example: MF../Z.6., MQ../Z.6.

MFI21A/Z16F/AF0

Connection technology

AF0 = Metric cable entry
 AF1 = with micro-style connector/M12 connector
 DeviceNet and CANopen
 AF2 = M12 plug connector for PROFIBUS
 AF3 = M12 plug connector for PROFIBUS +
 M12 plug connector for DC 24 V supply
 AF6 = M12 plug connector for
 AS-Interface connection

Connection module

Z16 = For INTERBUS
 Z26 = For PROFIBUS
 Z36 = For DeviceNet and CANopen
 Z66 = For AS-Interface

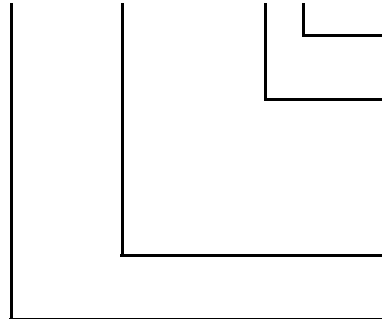
Fieldbus interface

MFI../MQI.. = INTERBUS
 MFP../MQP.. = PROFIBUS
 MFD../MQD.. = DeviceNet
 MFO.. = CANopen
 MFK.. = AS-Interface



4.4.3 Example: MF../MM../Z.7., MQ../MM../Z.7.

MFI22A/MM15C-503-00/Z17F 0



Connection type

0 = / 1 =

Connection module

Z17 = for INTERBUS

Z27 = for PROFIBUS

Z37 = for DeviceNet and CANopen

Z67 = for AS-Interface

MOVIMOT® inverter

Fieldbus interface

MFI../MQI.. = INTERBUS

MFP../MQP.. = PROFIBUS

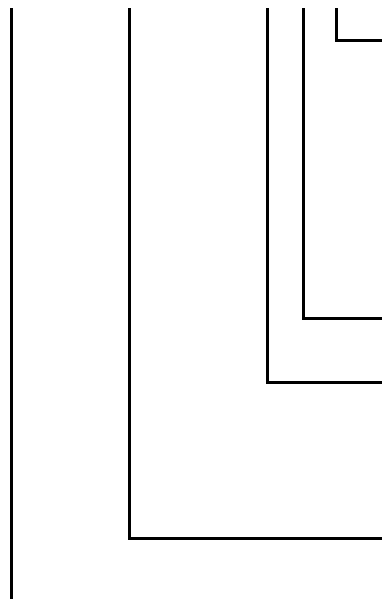
MFD../MQD.. = DeviceNet

MFO.. = CANopen

MFK.. = AS-Interface

4.4.4 Example: MF../MM../Z.8., MQ../MM../Z.8.

MFI22A/MM22C-503-00/Z18F 0/AF0



Connection technology

AF0 = Metric cable entry

AF1 = with micro-style connector/M12 connector
DeviceNet and CANopen

AF2 = M12 plug connector for PROFIBUS

AF3 = M12 plug connector for PROFIBUS +

M12 plug connector for DC 24 V supply

AF6 = M12 plug connector for
AS-Interface connection

Connection type

0 = / 1 =

Connection module

Z18 = for INTERBUS

Z28 = for PROFIBUS

Z38 = for DeviceNet and CANopen

Z68 = for AS-Interface

MOVIMOT® inverter

Fieldbus interface

MFI../MQI.. = INTERBUS

MFP../MQP.. = PROFIBUS

MFD../MQD.. = DeviceNet

MFO.. = CANopen

MFK.. = AS-Interface



5 Mechanical Installation

5.1 Installation instructions

	TIP
	On delivery, field distributors are equipped with transportation protection covering the plug connector of the outgoing motor circuit (hybrid cable). This only guarantees enclosure IP40. To attain the specified enclosure rating, remove the transport protection and plug on the appropriate mating connector. Screw them together.

5.1.1 Assembly

- Mount field distributors on a level, vibration-proof and torsionally rigid support structure only.
- Use M5 screws with matching washers to connect the **MFZ.3** field distributor. Tighten the screws with a torque wrench (permitted tightening torque 2.8 – 3.1 Nm (25 – 27 lb.in)).
- Use M6 screws and suitable washers for installing **MFZ.6**, **MFZ.7** or **MFZ.8** field distributors. Tighten the screws with a torque wrench (permitted tightening torque 3.1 – 3.5 Nm (27 – 31lb.in)).

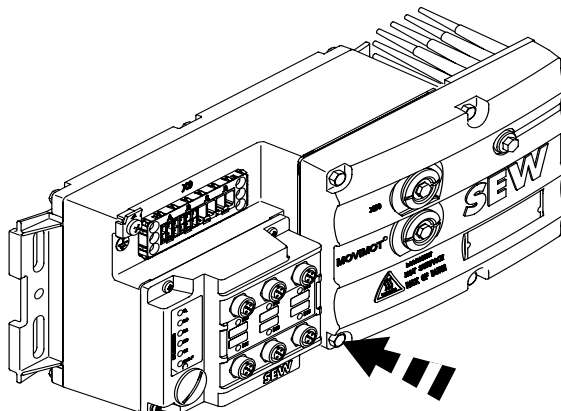
5.1.2 Installation in damp locations or in the open

- Use suitable screw fittings for the cables (use reducing adapters if necessary).
- Seal open cable entries and M12 connection sockets with screw plugs.
- When the cable entry is on the side of the unit, route the cable using a drip loop.
- Check and, if necessary, clean the sealing surfaces before re-mounting the fieldbus interface/the connection box cover.



5.2 Tightening torques

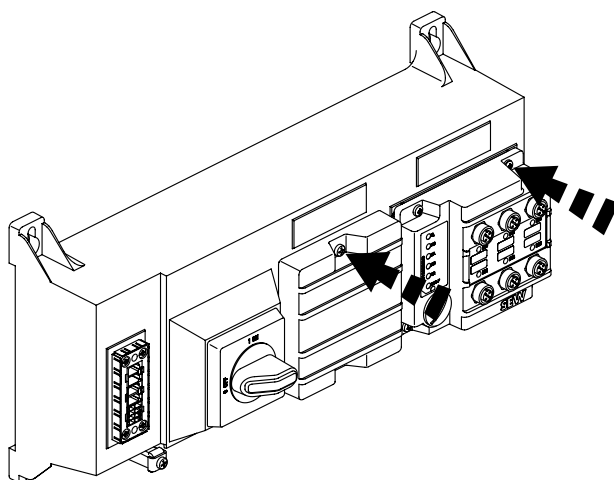
5.2.1 MOVIMOT® inverter



1138500619

Tighten the screws on the MOVIMOT® inverter using 3.0 Nm (27 lb.in) working diagonally across.

5.2.2 Fieldbus interfaces/connection box cover

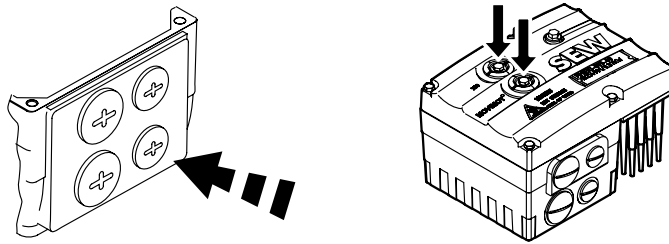


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Tighten the screws on the fieldbus interfaces or connection box cover using 2.5 Nm (22 lb.in) working diagonally across.



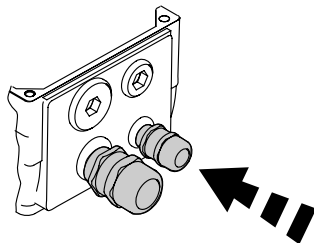
5.2.3 Screw plugs



1138509067

Tighten the blanking plugs and the screw plugs of potentiometer f1 and that of connection X50, if applicable, using 2.5 Nm (22 lb.in).

5.2.4 EMC cable glands



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Tighten EMC cable glands supplied by SEW-EURODRIVE using the following torque ratings:

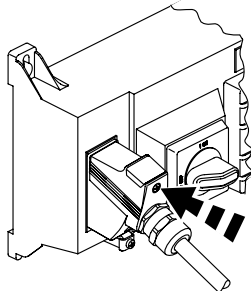
Screw fitting	Tightening torque
M12 x 1.5	2.5 Nm – 3.5 Nm (22 – 31 lb.in)
M16 x 1.5	3.0 Nm – 4.0 Nm (27 – 35 lb.in)
M20 x 1.5	3.5 Nm – 5.0 Nm (31 – 44 lb.in)
M25 x 1.5	4.0 Nm – 5.5 Nm (35 – 49 lb.in)

The cable retention in the cable gland must be able to withstand the following removal force:

- Cable with outer diameter > 10 mm: ≥ 160 N
- Cable with outer diameter < 10 mm: $= 100$ N



5.2.5 Motor cable



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Tighten screws for motor cables using 1.2 – 1.8 Nm (11 – 16 lb.in).



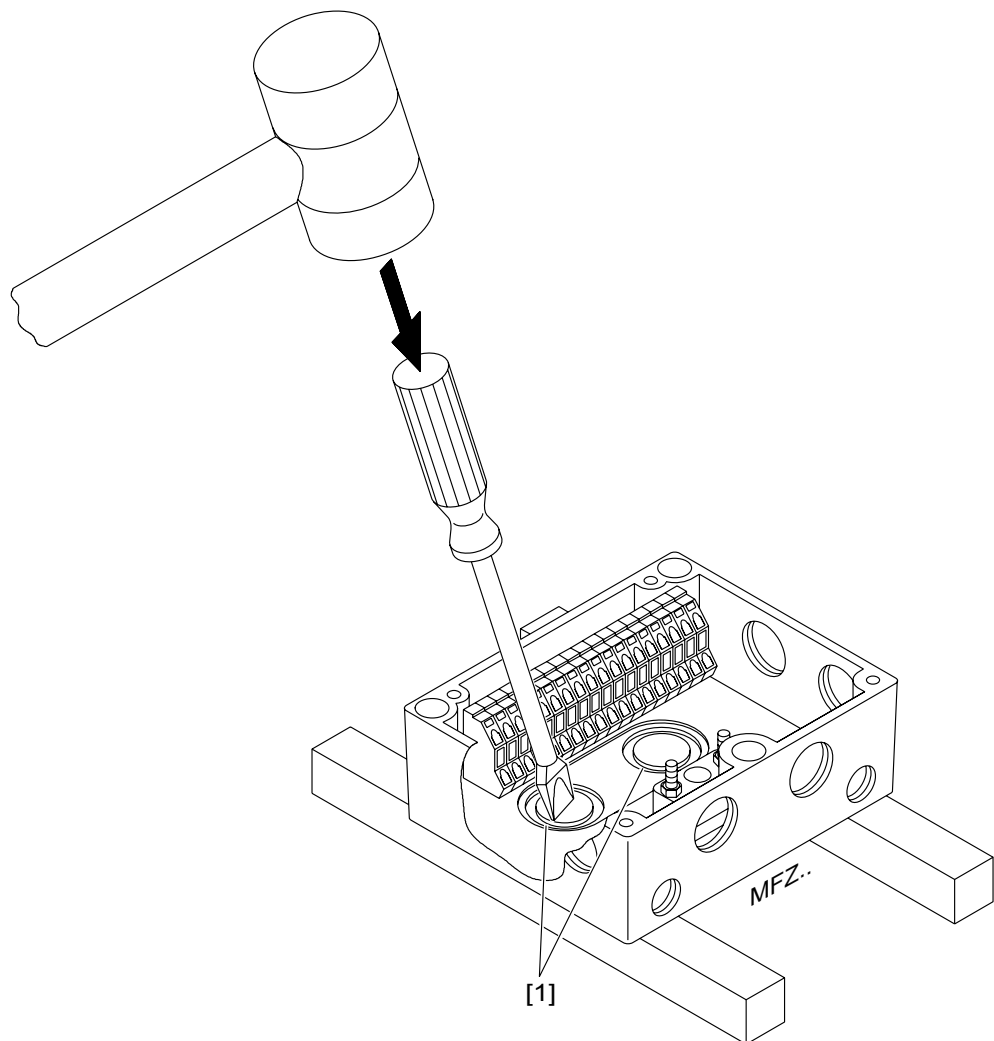
5.3 MF.. / MQ.. fieldbus interfaces

MF../MQ.. fieldbus interfaces can be installed as follows:

- Installation on MOVIMOT® connection box
- Installation in the field

5.3.1 Installation on MOVIMOT® connection box

1. Remove knock outs on MFZ underside from the inside, as illustrated in the following figure:



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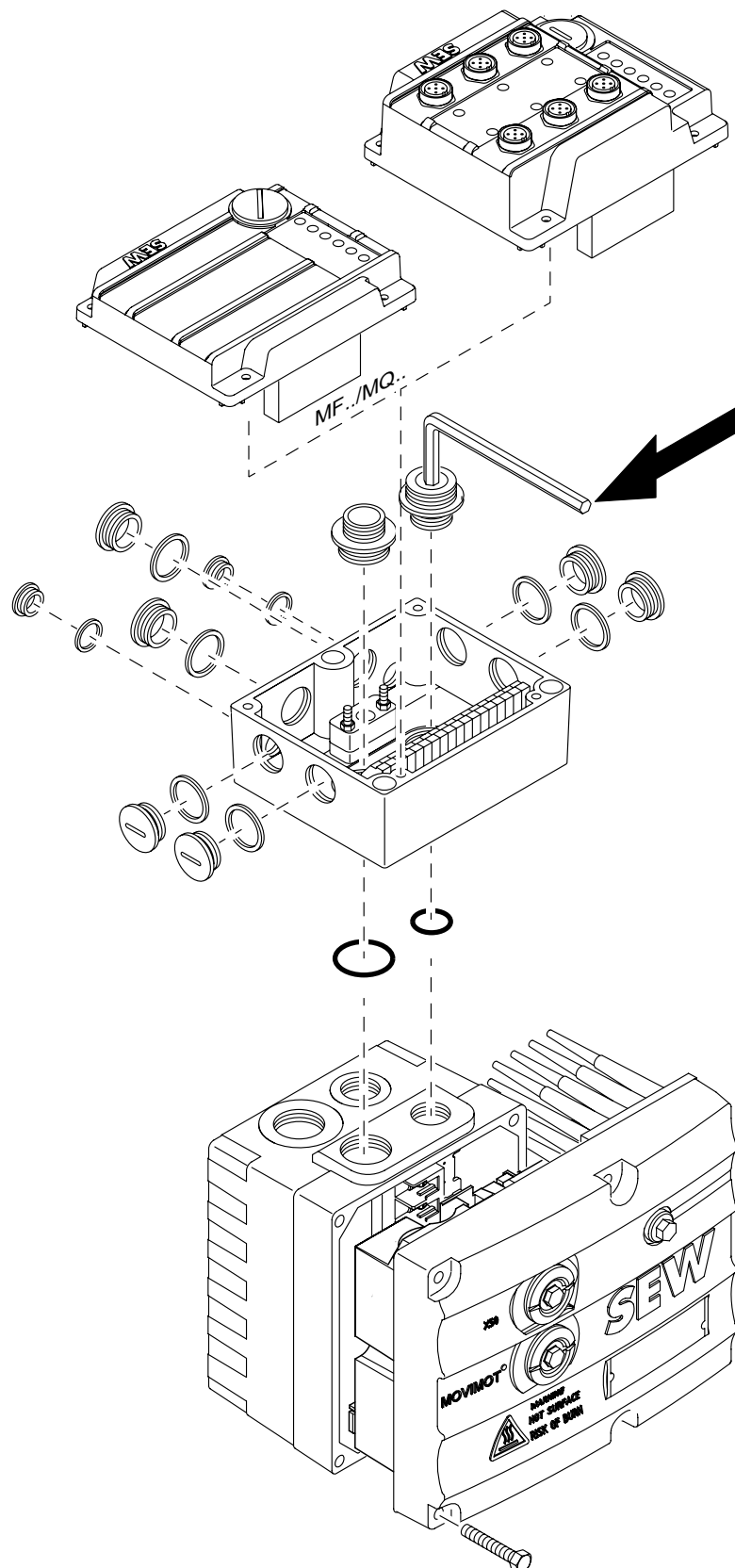


TIP

If necessary, debur any break lines that occur after the knock outs [1] have been removed.



2. Install the fieldbus interface on the MOVIMOT® connection box according to the following figure:

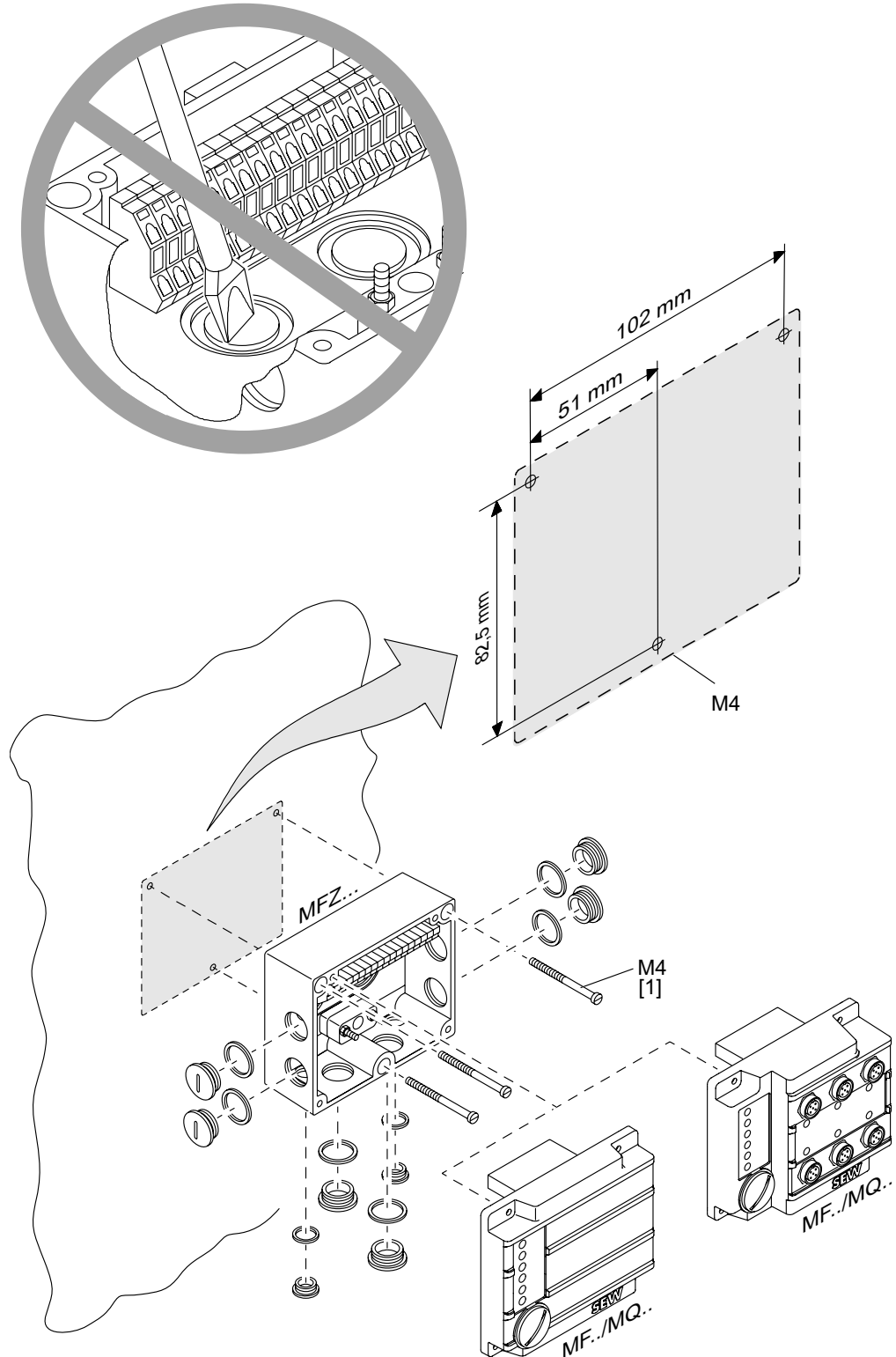


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5.3.2 Installation in the field

The following figure shows the installation of an MF../MQ.. in the field: Fieldbus interface:



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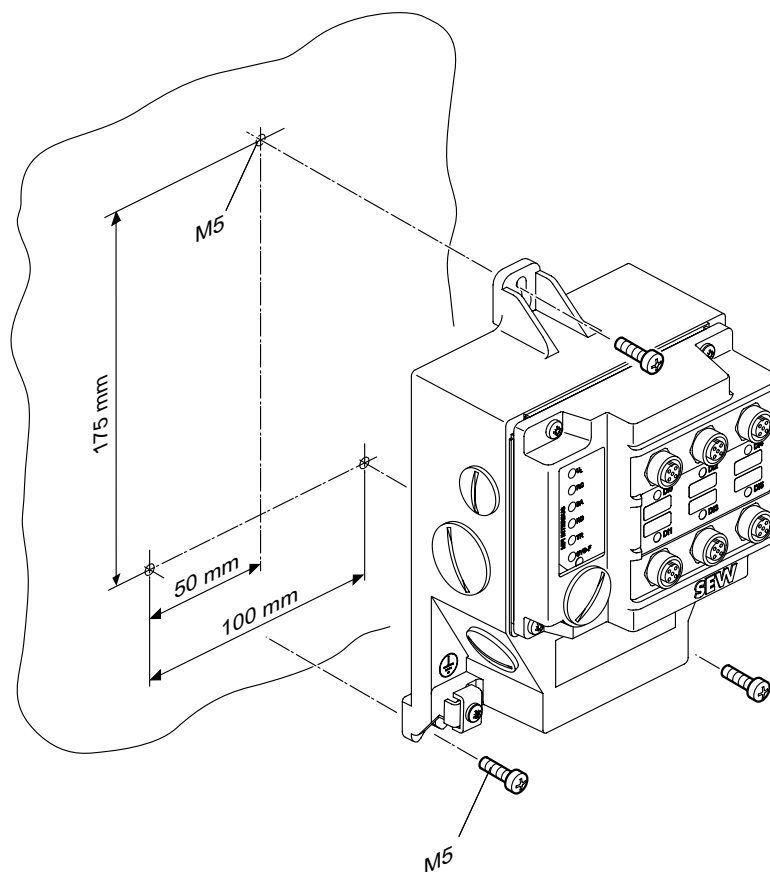
[1] Length of screws min. 40 mm



5.4 Field distributors

5.4.1 Installation of MF../Z.3., MQ../Z.3. field distributors

The following figure shows the mounting dimensions for ..Z.3. field distributors:

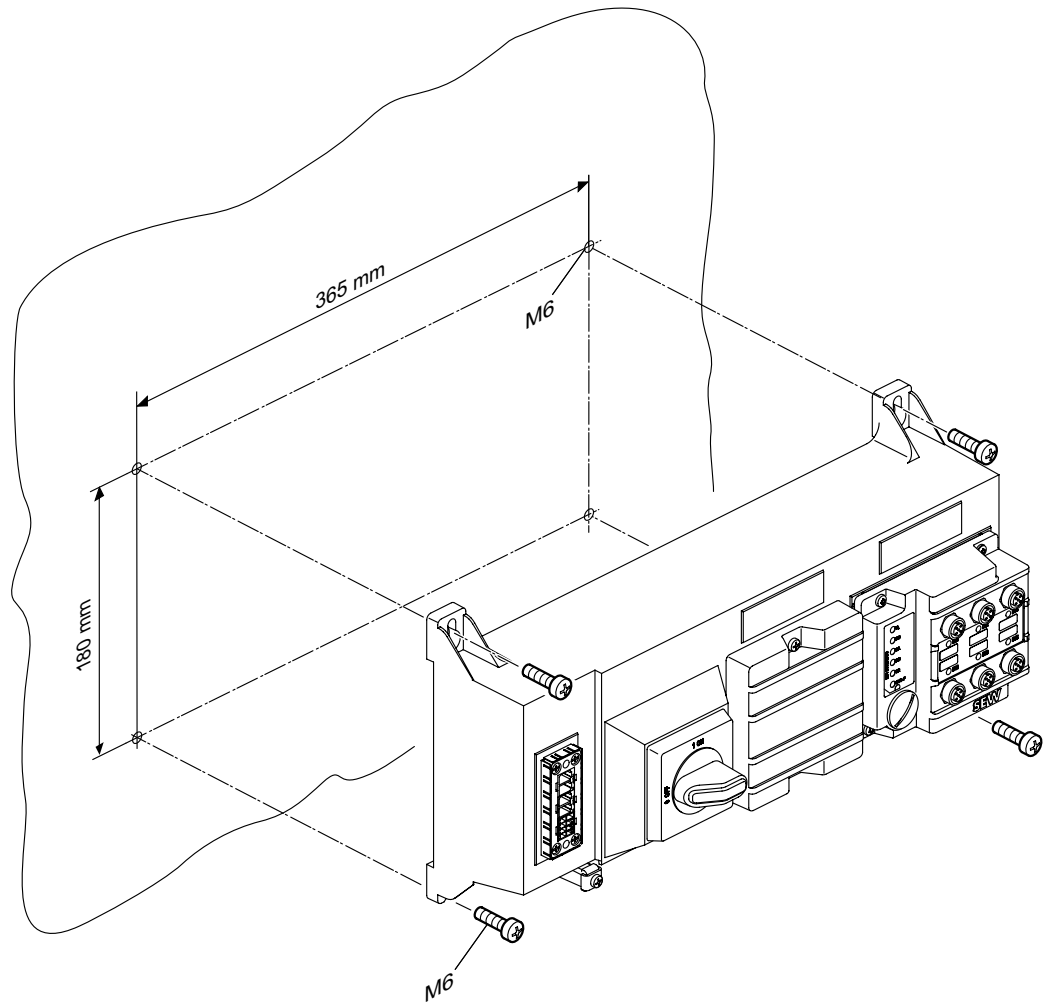


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5.4.2 Installation of MF../Z.6., MQ../Z.6. field distributors

The following figure shows the mounting dimensions for ..Z.6. field distributors:

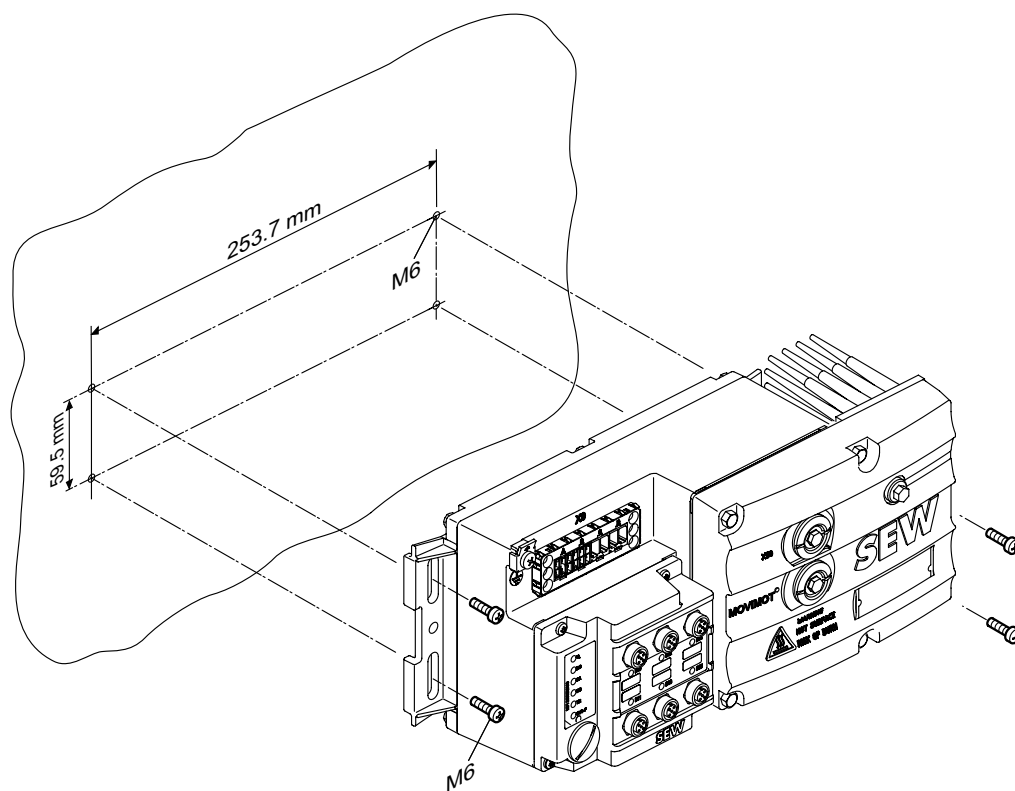


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5.4.3 Installation of MF../MM../Z.7., MQ../MM../Z.7. field distributors

The following figure shows the mounting dimensions for ..Z.7. field distributors:

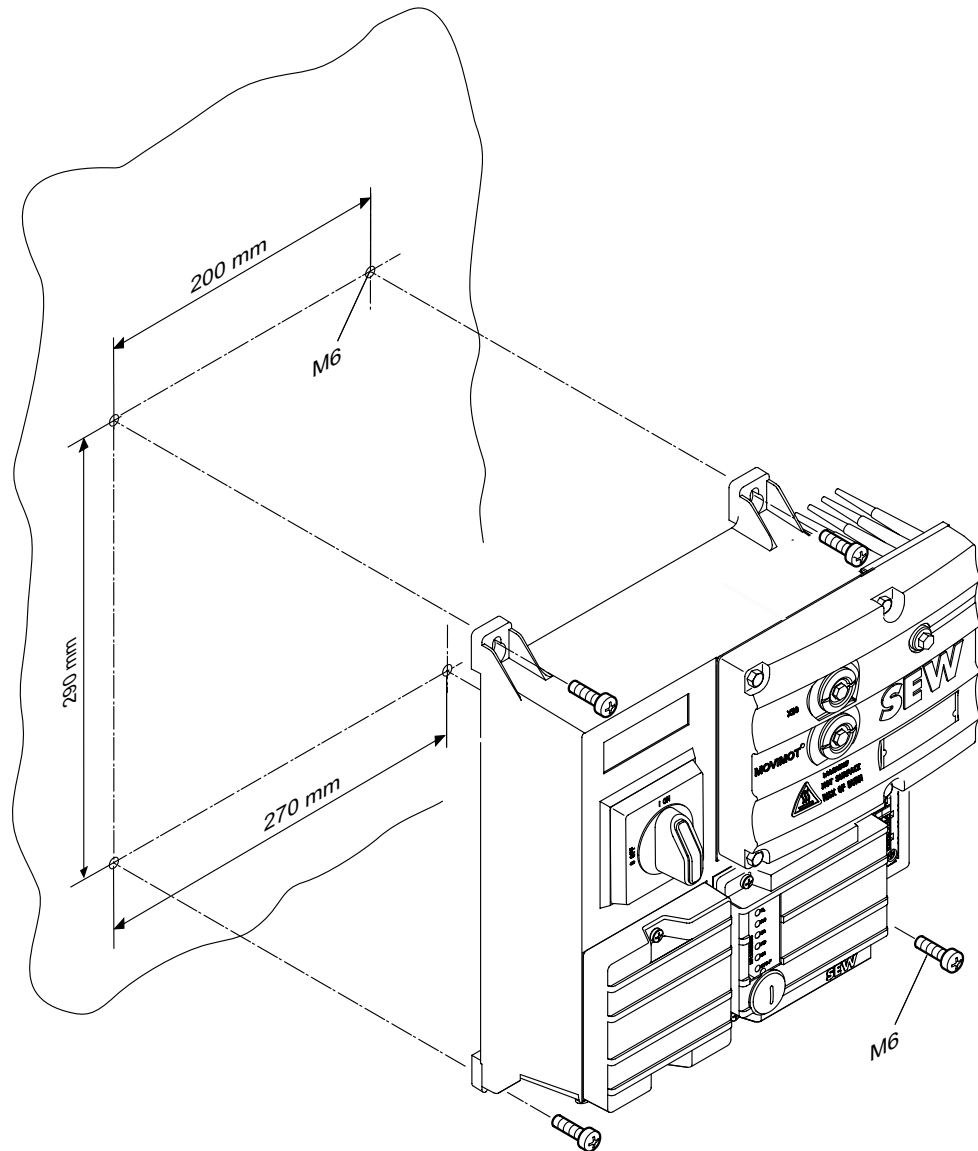


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5.4.4 Installation of MF../MM../Z.8., MQ../MM../Z.8. field distributors (Size 1)

The following figure shows the mounting dimensions for ..Z.8. field distributors: (size 1):

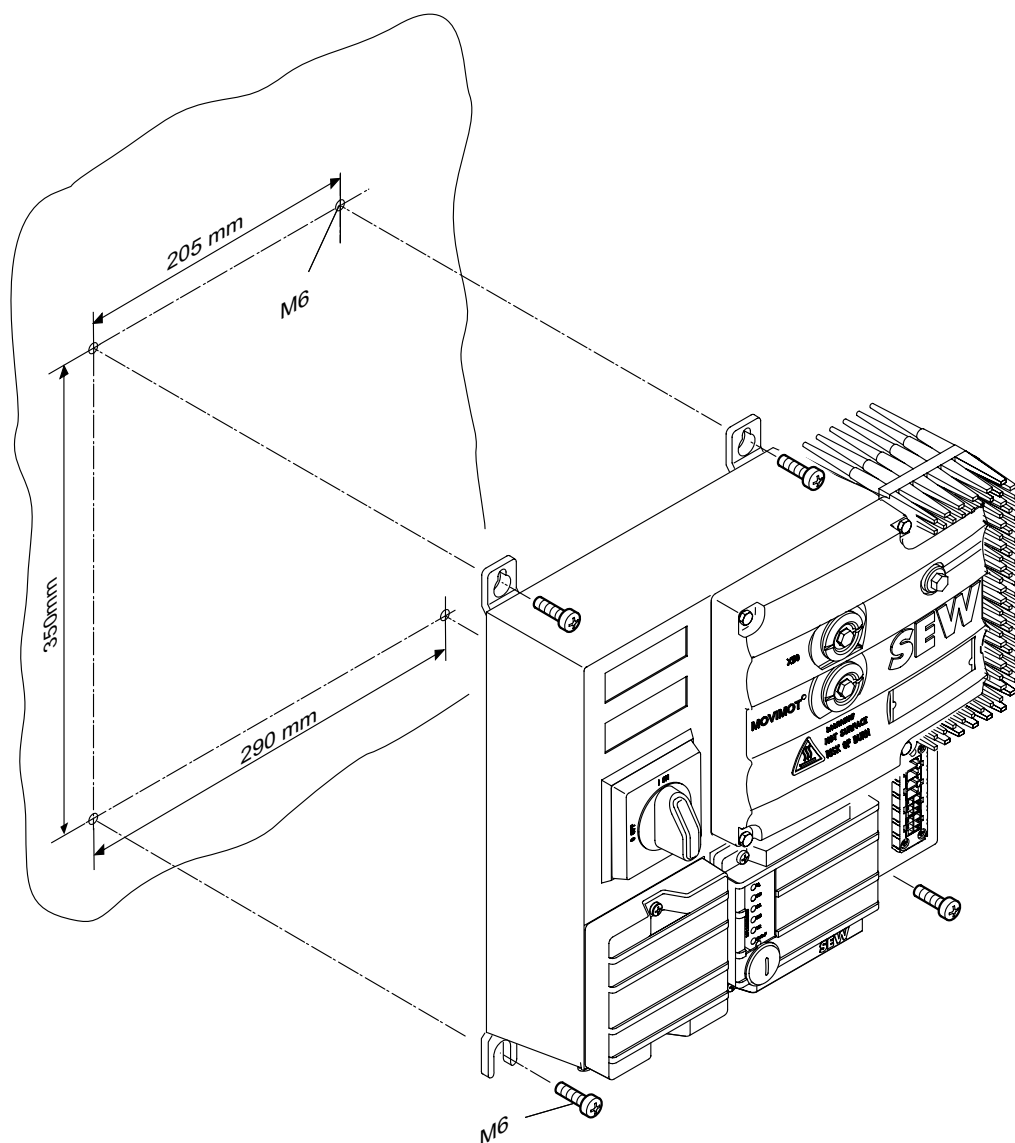


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5.4.5 Installation of MF../MM../Z.8., MQ../MM../Z.8. field distributors (Size 2)

The following figure shows the mounting dimensions for ..Z.8. field distributors: (size 2):



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6 Electrical Installation

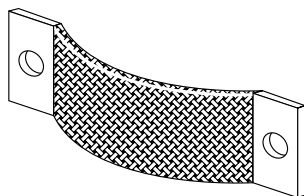
6.1 Installation planning considering EMC aspects

6.1.1 Notes on arranging and routing installation components

Successful installation of decentralized drives depends on selecting the correct cables, providing correct grounding and a functioning equipotential bonding.

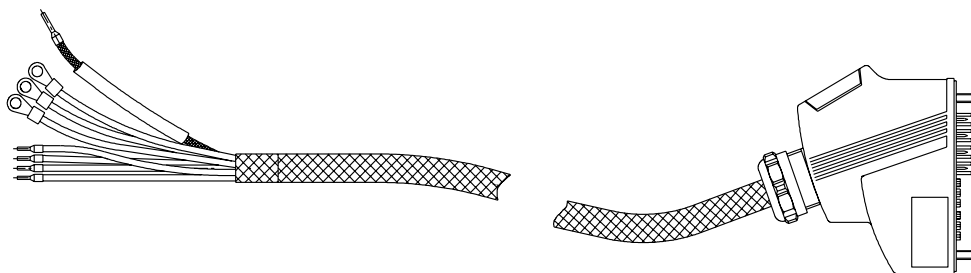
You should always apply **relevant standards**. You also need to consider the following points:

- **Equipotential bonding**
 - Low-impedance, HF-capable equipotential bonding must be provided independent of the functional ground (PE terminal) (see also VDE 0113 or VDE 0100 part 540) using, for example
 - Flat contact surface connection of metal components
 - Flat grounding strips (HF stranded wire)



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- Do not use the cable shield of data lines for equipotential bonding.
- **Data lines and 24 V supply**
 - Must be routed separately from cables that emit interference (e.g. control cables from solenoid valves, motor cables).
- **Field distributor**
 - We recommend using prefabricated SEW hybrid cables especially designed for connecting field distributors and motors.



1138899339

- **Cable glands**
 - Select a cable gland with large contact surface shielding (see the notes on selection and correct installation of cable glands).

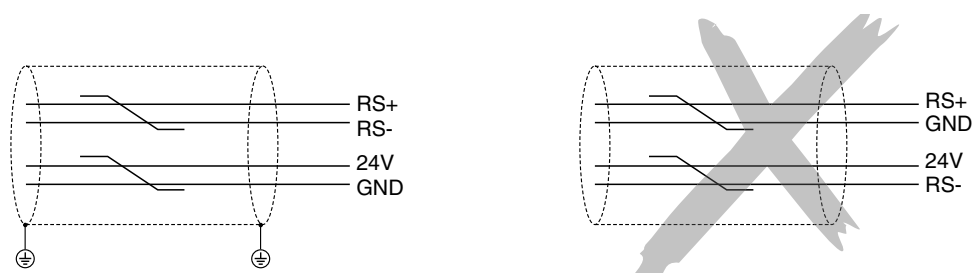


- **Cable shield**
 - The cable shield must have good EMC characteristics (high shield attenuation),
 - It must protect the cable mechanically and as a shield,
 - It must be connected with the unit's metal housing (via EMC metal cable glands) at the flat contact surface cable ends (see the further notes in this chapter on selection and correct installation of cable glands).
- **Additional information is available in the SEW publication "Drive Engineering – Practical Implementation, EMC in Drive Engineering."**

6.1.2 Sample connection between a MF.. / MQ.. fieldbus interface and MOVIMOT®

If the MF../MQ.. fieldbus interface and MOVIMOT® are installed separately, the RS-485 connection must be implemented as follows:

- **If the connection also carries the DC 24 V supply**
 - Use shielded lines
 - Apply shielding to the housing of both units via EMC metal cable glands (consult the other notes in this chapter on appropriate assembly of EMC metal cable glands as well)
 - Strand cores in pairs (see the following illustration)

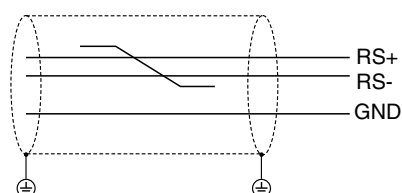


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- **If the connection does not carry the DC 24 V supply**

If MOVIMOT® is supplied with DC 24 V via a separate connection, the RS-485 connection must be carried out as follows:

 - Use shielded lines
 - Apply shielding to the housing of both units via EMC metal cable glands (consult the other notes in this chapter on selection and appropriate assembly of cable glands as well)
 - The GND reference potential must be provided for the RS-485 interface
 - Strand the cores (see the following illustration)



1138973579

**6.2 Installation instructions for fieldbus interfaces/field distributors****6.2.1 Connecting supply system leads**

- The rated voltage and frequency of the MOVIMOT[®] inverter must correspond to the data for the supply system.
- Select the cable cross section according to the input current I_{line} for rated power (see Technical Data).
- Install line fuses at the beginning of the supply system line behind the supply bus junction. Use D, DO, NH fuses or circuit breakers. Select the fuse size according to the cable cross section.
- Do not use a conventional earth leakage circuit-breaker as a protective device. Universal current-sensitive earth-leakage circuit breakers ("type B") are permitted as a protective device. During normal operation of MOVIMOT[®] drives, earth-leakage currents > 3.5 mA can occur.
- In accordance with EN 50178, a second PE connection (at least with the same cross-section as the supply system lead) is required parallel to the protective earth via separate points of connection. Leakage currents > 3.5 mA may arise during operation.
- Use contactor switch contacts from utilization category AC-3 according to IEC 158 to connect MOVIMOT[®] drives.
- SEW-EURODRIVE recommends using earth-leakage monitors with pulse code measuring in voltage supply systems with a non-grounded star point (IT systems). Using such devices prevents the earth-leakage monitor mis-tripping due to the ground capacitance of the inverter.



6.2.2 Notes on PE connection and/or equipotential bonding

	! DANGER
	Faulty PE connection. Death, severe injuries or damage to property from electric shock. - The permitted tightening torque for the screw fitting is 2.0 - 2.4 Nm (18 - 21 lb.in). - Observe the following notes regarding PE connection.

Prohibited assembly sequence	Recommendation: Assembly with forked cable lug Permitted for all cross sections	Assembly with thick solid wire Permitted for cross sections up to max. 2.5 mm ²
323042443	323034251	323038347

[1] Forked cable lug suitable for M5 PE screws

6.2.3 Permitted connection cross section and current carrying capacity of the terminals

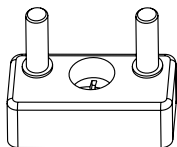
	Power terminals X1, X21 (screw terminals)	Control terminals X20 (cage clamp terminals)
Connection cross section (mm ²)	0.2 mm ² - 4 mm ²	0.08 mm ² - 2.5 mm ²
Connection cross section (AWG)	AWG 24 – AWG 10	AWG 28 – AWG 12
Current carrying capacity	32 A max. continuous current	12 A max. continuous current

The permitted tightening torque of the power terminals is 0.6 Nm (5 lb.in).



6.2.4 Looping through the DC 24 V supply voltage in the MFZ.1 module terminal box

- Two M4 x 12 studs are located on the connection part of the DC 24 V supply. These studs can be used for looping through the DC 24 V supply voltage.

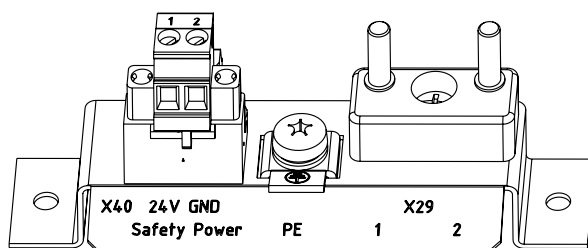


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- The terminal studs have a current carrying capacity of 16 A.
- The permitted tightening torque for the hex nuts of the terminal studs is 1.2 Nm (11 lb.in) $\pm$ 20%.

6.2.5 Additional connection options with MFZ.6, MFZ.7 and MFZ.8 field distributors

- The connection part of the DC 24 V supply comprises a X29 terminal block with two M4 x 12 studs and a pluggable X40 terminal.



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- The X29 terminal block can be used as an alternative to the X20 terminal (section "Unit Structure" (see page 14)) for looping through the DC 24 V supply voltage. Both studs are connected internally to the 24 V connection at terminal X20.

Terminal assignment			
No.		Name	Function
X29	1	24 V	24 V voltage supply for module electronics and sensors (Studs, jumpered with terminal X20/11)
	2	GND	0V24 reference potential for module electronics and sensors (Studs, jumpered with terminal X20/13)

- The plug-in terminal X40 ("Safety Power") is intended for the external DC 24 V supply of the MOVIMOT[®] inverter via an emergency stop relay.

This setup allows for the operation of a MOVIMOT[®] drive in safety applications. For more information, refer to the documentation on "Safe Disconnection for MOVIMOT[®] MM.." of the respective MOVIMOT[®] drives.

Terminal assignment			
No.		Name	Function
X40	1	24 V	24 V voltage supply for MOVIMOT [®] for disconnection with emergency stop relay
	2	GND	0V24 reference potential for MOVIMOT [®] for disconnection with emergency stop relay



- Terminal X29/1 is factory-jumpered with X40/1 and terminal X29/2 with X40/2, so that the MOVIMOT® inverter is supplied by the same DC 24 V voltage as the fieldbus interface.
- The guide values for both studs are:
 - Current carrying capacity: 16 A
 - Permitted tightening torque for the hex nuts: 1.2 Nm (11 lb.in) $\pm$ 20%.
- The guide values for screw terminal X40 are:
 - Current carrying capacity: 10 A
 - Connection cross-section: 0.25 mm² – 2.5 mm² (AWG24 – AWG12)
 - Permitted tightening torque: 0.6 Nm (5 lb.in)

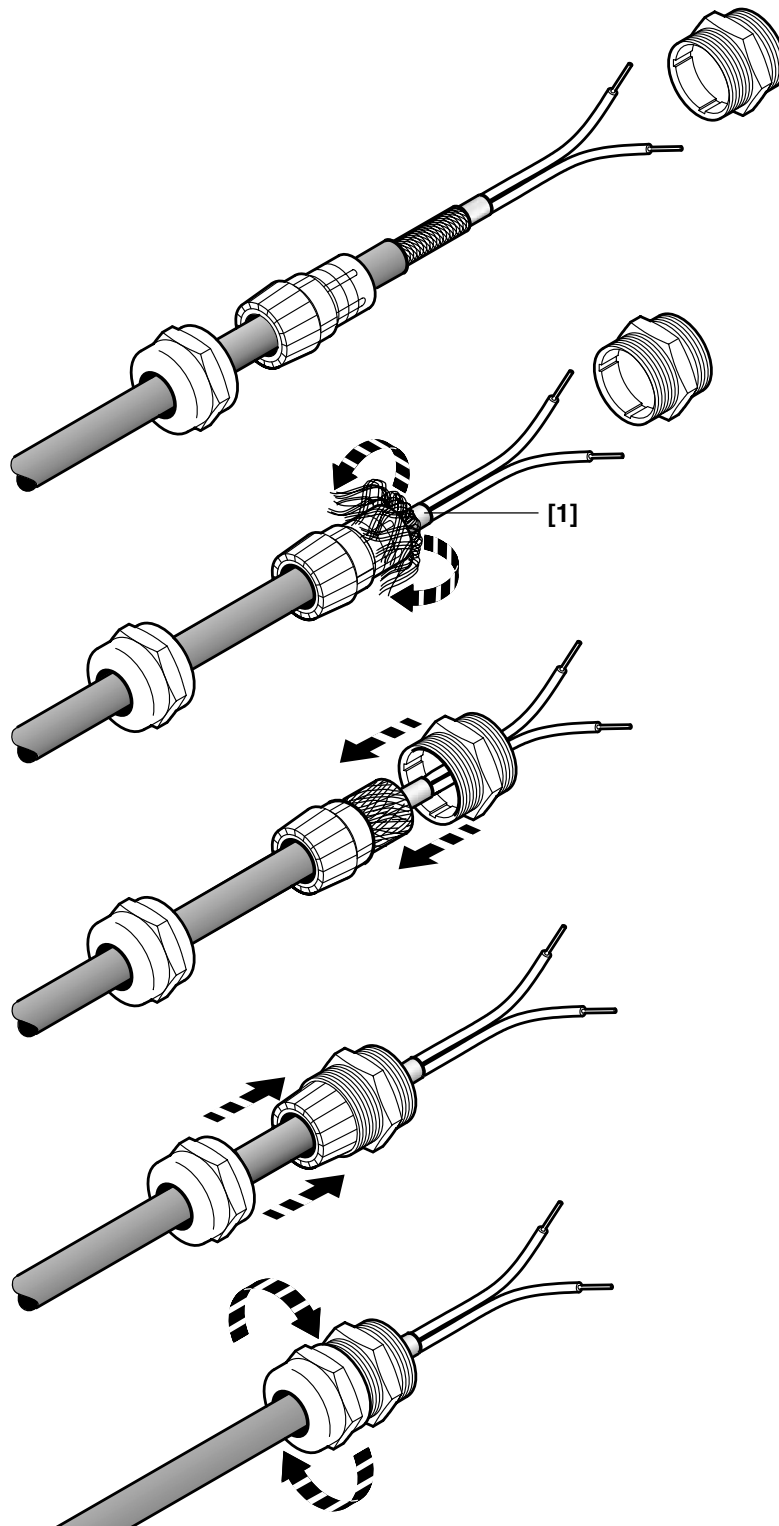
6.2.6 UL-compliant installation for field distributors

- Use only copper cables in the temperature range 60/75 °C as the connection lead.
- Use only tested units with a limited output voltage ($V \leq \text{DC } 30 \text{ V}$) and limited output current ($I \leq 8 \text{ A}$) as an external DC 24 V voltage source.
- The UL certification only applies to operation on voltage networks with voltages to ground up to a maximum of 300 V.



6.2.7 EMC metal cable glands

Install the EMC metal cable glands from SEW as follows:



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Important: Cut off insulation foil [1], do not fold it back.



6.2.8 Wiring check



DANGER

It is necessary to check the wiring before energizing the system for the first time in order to prevent injury to persons or damage to the system.

Severe or fatal injuries from electric shock.

- Remove all fieldbus interfaces from the connection module
- Disconnect all MOVIMOT[®] inverters from the connection module (only with MFZ.7, MFZ.8)
- Disconnect all plug connectors of the motor connection (hybrid cable) from the field distributor
- Check the insulation of the wiring in accordance with applicable national standards
- Check the grounding.
- Check insulation between the supply system cable and the DC 24 V cable
- Check the insulation between mains cable and communication cable.
- Check the polarity of the DC 24 V cable
- Check the polarity of the communication line
- Check the mains phase sequence
- Ensure equipotential bonding between the fieldbus interfaces

After the wiring check

- Connect and fasten all motor connections (hybrid cable)
- Connect and fasten all fieldbus interfaces
- Install and fasten all MOVIMOT[®] inverters (for MFZ.7, MFZ.8 only)
- Install all connection box covers
- Cover any plug connections not in use



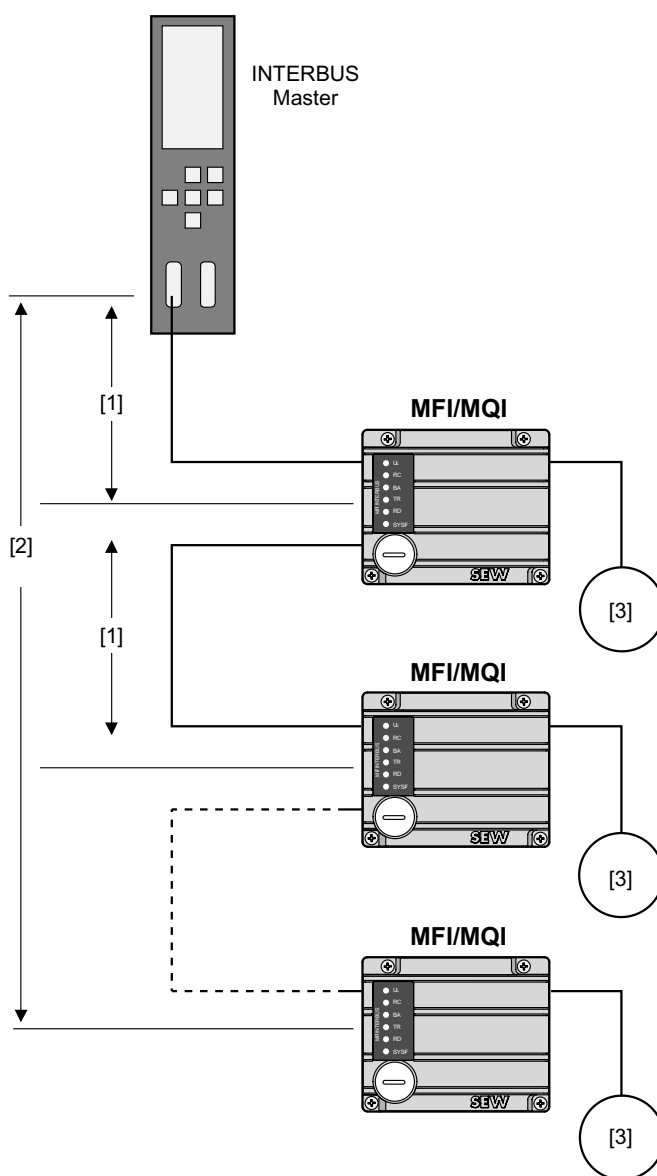
6.3 Connection with INTERBUS (copper line)

6.3.1 INTERBUS interfaces

The MFI../MQI.. fieldbus interfaces can be operated on both the remote bus and the installation remote bus. The principal distinguishing feature between these types of interfaces is the structure of the bus cable. Standard remote bus cables consist of 2-core cables twisted together in three pairs for data transmission. In addition to the data transmission wires, the installation remote bus may also carry the power supply for the MFI../MQI.. and active sensors.

Remote bus connection

The typical remote bus connection for IP20 units involves a 9-pin D-sub plug. The following wiring examples show how MFI../MQI.. are connected to units on the input or output end using 9-pin D-sub plugs.



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- [1] max. 400 m (max. 1,200 ft.)
- [2] max. 12.8 km (max. 8 miles)
- [3] Drive

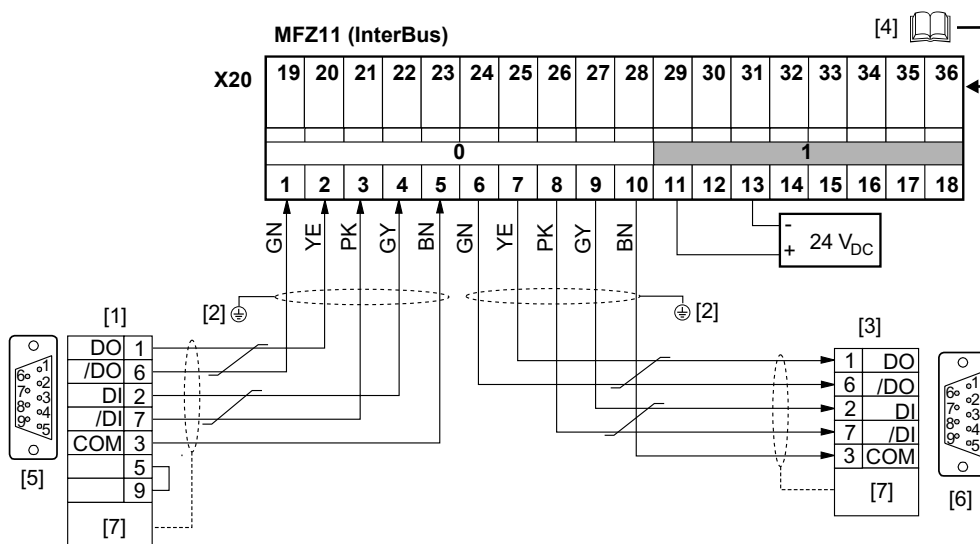


Line type D9-MFI (9-pin D-sub to MFI)

The incoming remote bus is picked off from the preceding INTERBUS module using a 9-pin D-sub plug.

Line type MFI-D9 (MFI to 9-pin D-sub)

The subsequent INTERBUS module is connected using a 9-pin D-sub socket.



1360755979

0 = Potential level 0 **1** = Potential level 1

- [1] Incoming remote bus cable
- [2] Connect the shield of the incoming/outgoing remote bus cable to the MFZ.. housing with an EMC metal cable gland
- [3] Outgoing remote bus cable
- [4] Assignment of terminals 19 - 36 chapter "Connection of MF../MQ.. fieldbus interface inputs/outputs (I/O)" (see page 64)
- [5] 9-pin D-sub connector
- [6] 9-pin D-sub socket
- [7] Strain relief

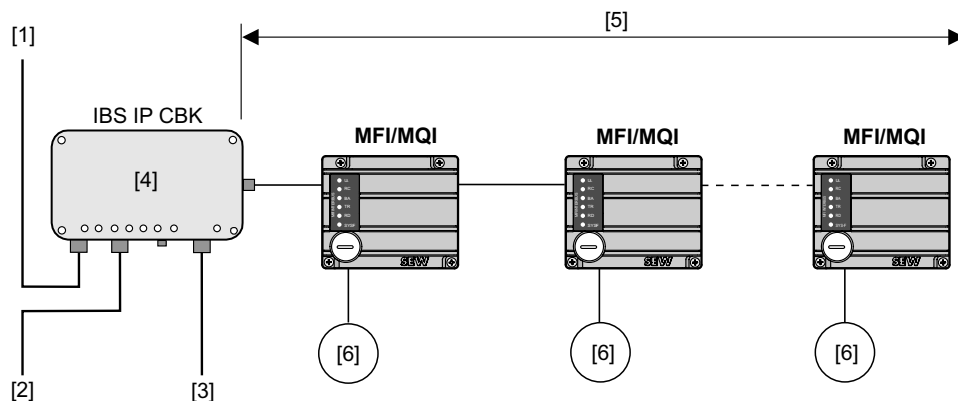


Electrical Installation

Connection with INTERBUS (copper line)

Installation remote bus connection

An 8-core cable is used for the installation remote bus. In addition to the strands for transmission of data, the cable also carries the DC 24 V power supply for the MFI../MQI.. bus electronics and the active sensors.



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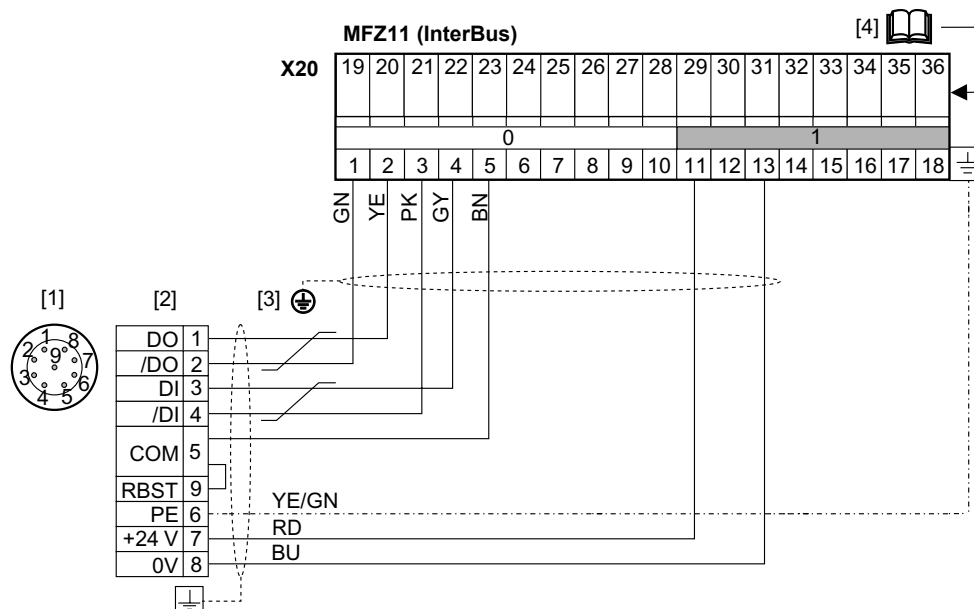
- [1] Incoming remote bus cable
- [2] Outgoing remote bus
- [3] 24 V supply voltage
- [4] Installation remote bus terminal
- [5] Installation remote bus max. 50 m
- [6] Drive

The maximum number of modules that can be connected to an installation remote bus terminal is determined by the current consumption of the individual modules.



Line type CCO-I
→ MFI (IP65
round connector →
MFI terminals)

A special INTERBUS installation remote bus terminal is required to open an installation remote bus segment. The installation remote bus can be connected to this bus terminal (e.g. type IBS IP CBK 1/24F) using an IP65 round plug connector (type CCO-I).

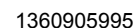


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0	= Potential level 0
1	= Potential level 1

- [1] IP65 round connector
- [2] Incoming installation remote bus cable
- [3] Connect shield of installation remote bus cable to the MFZ.. housing using an EMC metal cable gland.
- [4] Assignment of terminals 19 - 36
chapter "Connection of MF../MQ.. fieldbus interface inputs/outputs (I/O)" (see page 64)

6.3.2 Connecting the MFZ11 connection module to MOVIMOT® via MFI.. INTERBUS interface



1 = Potential level 1

- [1] For separate MFZ11/MOVIMOT® installation:
Connect the shield of the RS-485 cable with MFZ and the MOVIMOT® housing using the EMC metal cable gland
- [2] Ensure equipotential bonding between all bus stations
- [3]  Assignment of terminals 19 - 36 as described in chapter "Connection of fieldbus interface inputs/outputs (I/O)" (see page 64).
- [4] EMC metal cable gland

Terminal assignment				
No.		Name	Direction	Function
X20	1	/DO	Input	Incoming remote bus, negated data send direction (green)
	2	DO	Input	Incoming remote bus, data send direction (yellow)
	3	/DI	Input	Incoming remote bus, negated data reception direction (pink)
	4	DI	Input	Incoming remote bus, data reception direction (gray)
	5	COM	-	Reference potential (brown)
	6	/DO	Output	Outgoing remote bus, negated data send direction (green)
	7	DO	Output	Outgoing remote bus, data send direction (yellow)
	8	/DI	Output	Outgoing remote bus, negated data reception direction (pink)
	9	DI	Output	Outgoing remote bus, data reception direction (gray)
	10	COM	-	Reference potential (brown)
	11	24 V	Input	24 V voltage supply for module electronics and sensors
	12	24 V	Output	24 V voltage supply (jumped with terminal X20/11)
	13	GND	-	0V24 reference potential for module electronics and sensors
	14	GND	-	0V24 reference potential for module electronics and sensors
	15	24 V	Output	24 V voltage supply for MOVIMOT® (jumped with terminal X20/11)
	16	RS+	Output	Communication link to MOVIMOT® terminal RS+
	17	RS-	Output	Communication link to MOVIMOT® terminal RS-
	18	GND	-	0V24 reference potential for MOVIMOT® (jumped with terminal X20/13)

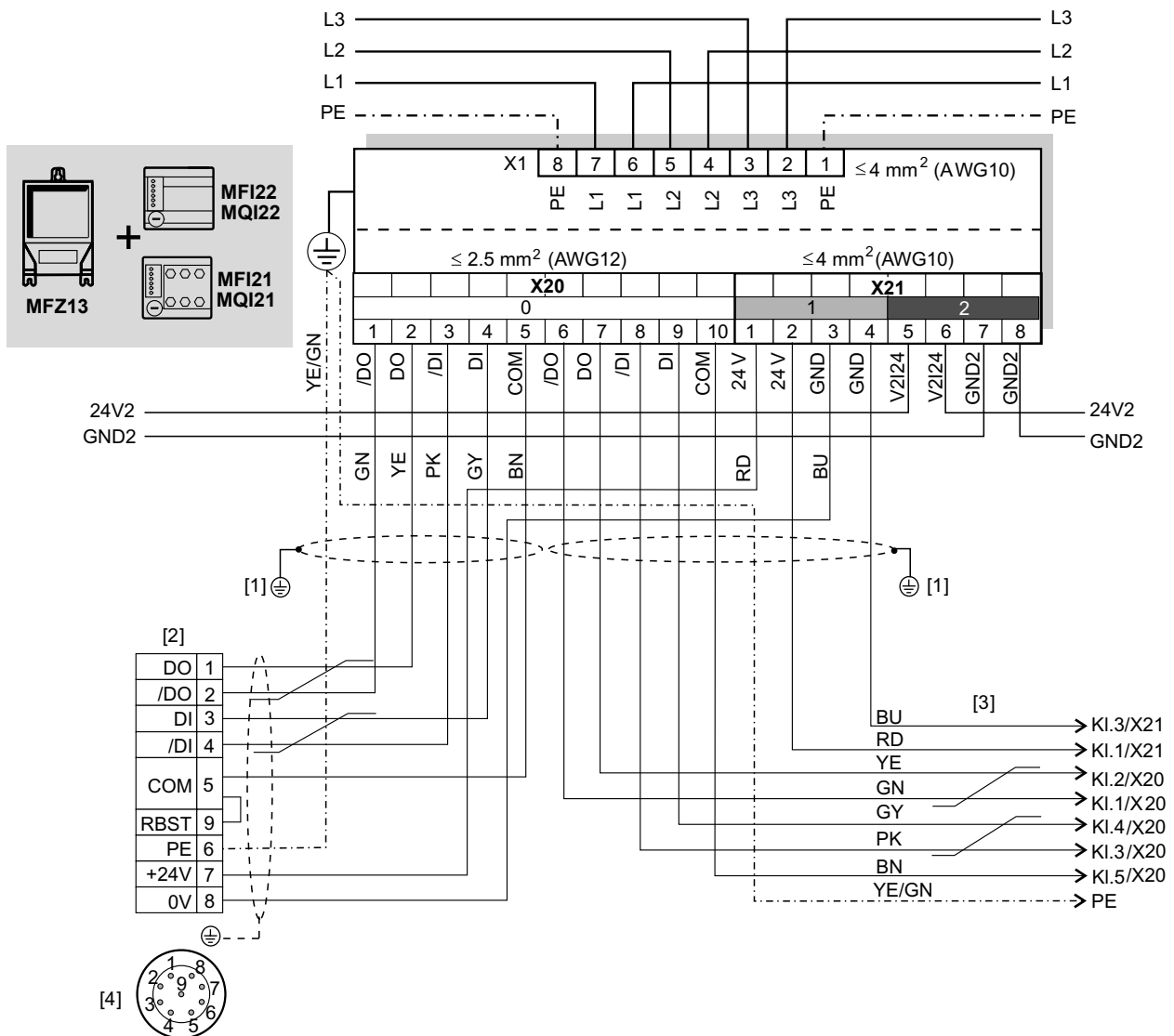


6.3.3 Connection MFZ13 field distributor with MFI../MQI.. interface (installation remote bus connection)

Line type CCO-I IP65 round connector → MFI../MQI.. terminals
→ MFI

A special INTERBUS installation remote bus terminal is required to open an installation remote bus segment. The installation remote bus can be connected to this bus terminal (e.g. type IBS IP CBK 1/24F) using an IP65 round plug connector (type CCO-I).

MFZ13 connection module with MFI21/MQI21, MFI22/MQI22 INTERBUS interface



1361313163

0 = Potential level 0 1 = Potential level 1 2 = Potential level 2

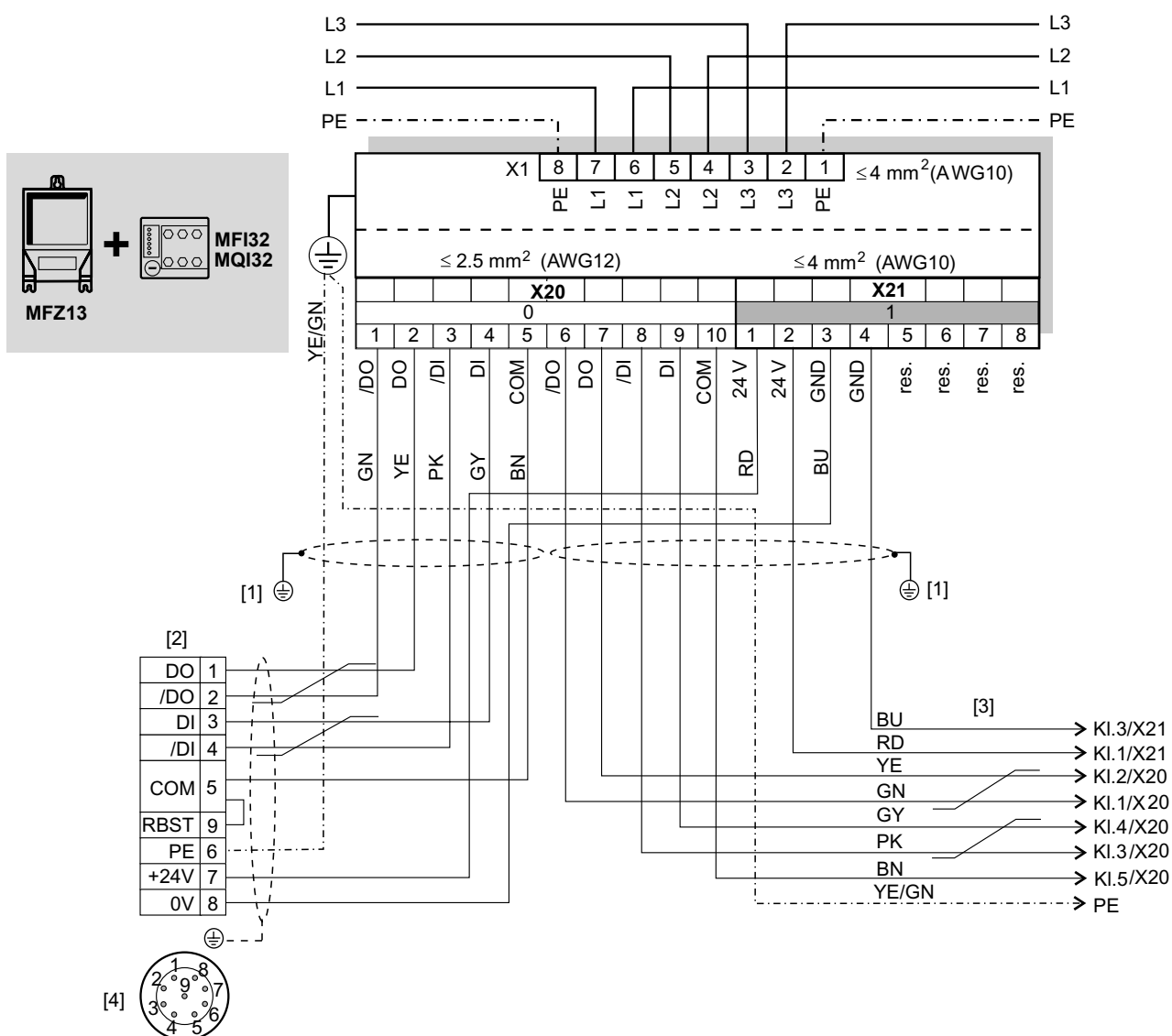
- [1] EMC metal cable gland
- [2] Incoming installation remote bus cable
- [3] Outgoing installation remote bus cable
- [4] IP65 round connector



Terminal assignment				
No.		Name	Direction	Function
X20	1	/DO	Input	Incoming remote bus, negated data send direction (green)
	2	DO	Input	Incoming remote bus, data send direction (yellow)
	3	/DI	Input	Incoming remote bus, negated data reception direction (pink)
	4	DI	Input	Incoming remote bus, data reception direction (gray)
	5	COM	-	Reference potential (brown)
	6	/DO	Output	Outgoing remote bus, negated data send direction (green)
	7	DO	Output	Outgoing remote bus, data send direction (yellow)
	8	/DI	Output	Outgoing remote bus, negated data reception direction (pink)
	9	DI	Output	Outgoing remote bus, data reception direction (gray)
	10	COM	-	Reference potential (brown)
X21	1	24 V	Input	24 V voltage supply for module electronics, sensors and MOVIMOT®
	2	24 V	Output	24 V voltage supply (jumpersed with terminal X21/1)
	3	GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
	4	GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
	5	V2I24	Input	24 V voltage supply for actuators (digital outputs)
	6	V2I24	Output	24 V voltage supply for actuators (digital outputs) jumpersed with terminal X21/5
	7	GND2	-	0V24 reference potential for actuators
	8	GND2	-	0V24 reference potential for actuators



MFZ13 connection module with MFI32/MQI32 INTERBUS interface



1361320971

0 = Potential level 0

1 = Potential level 1

- [1] EMC metal cable gland
- [2] Incoming installation remote bus cable
- [3] Outgoing installation remote bus cable
- [4] IP65 round connector



Terminal assignment			
No.	Name	Direction	Function
X20	1 /DO	Input	Incoming remote bus, negated data send direction (green)
	2 DO	Input	Incoming remote bus, data send direction (yellow)
	3 /DI	Input	Incoming remote bus, negated data reception direction (pink)
	4 DI	Input	Incoming remote bus, data reception direction (gray)
	5 COM	-	Reference potential (brown)
	6 /DO	Output	Outgoing remote bus, negated data send direction (green)
	7 DO	Output	Outgoing remote bus, data send direction (yellow)
	8 /DI	Output	Outgoing remote bus, negated data reception direction (pink)
	9 DI	Output	Outgoing remote bus, data reception direction (gray)
	10 COM	-	Reference potential (brown)
X21	1 24 V	Input	24 V voltage supply for module electronics, sensors and MOVIMOT®
	2 24 V	Output	24 V voltage supply (jumped with terminal X21/1)
	3 GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
	4 GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
	5 -	-	Reserved
	6 -	-	Reserved
	7 -	-	Reserved
	8 -	-	Reserved

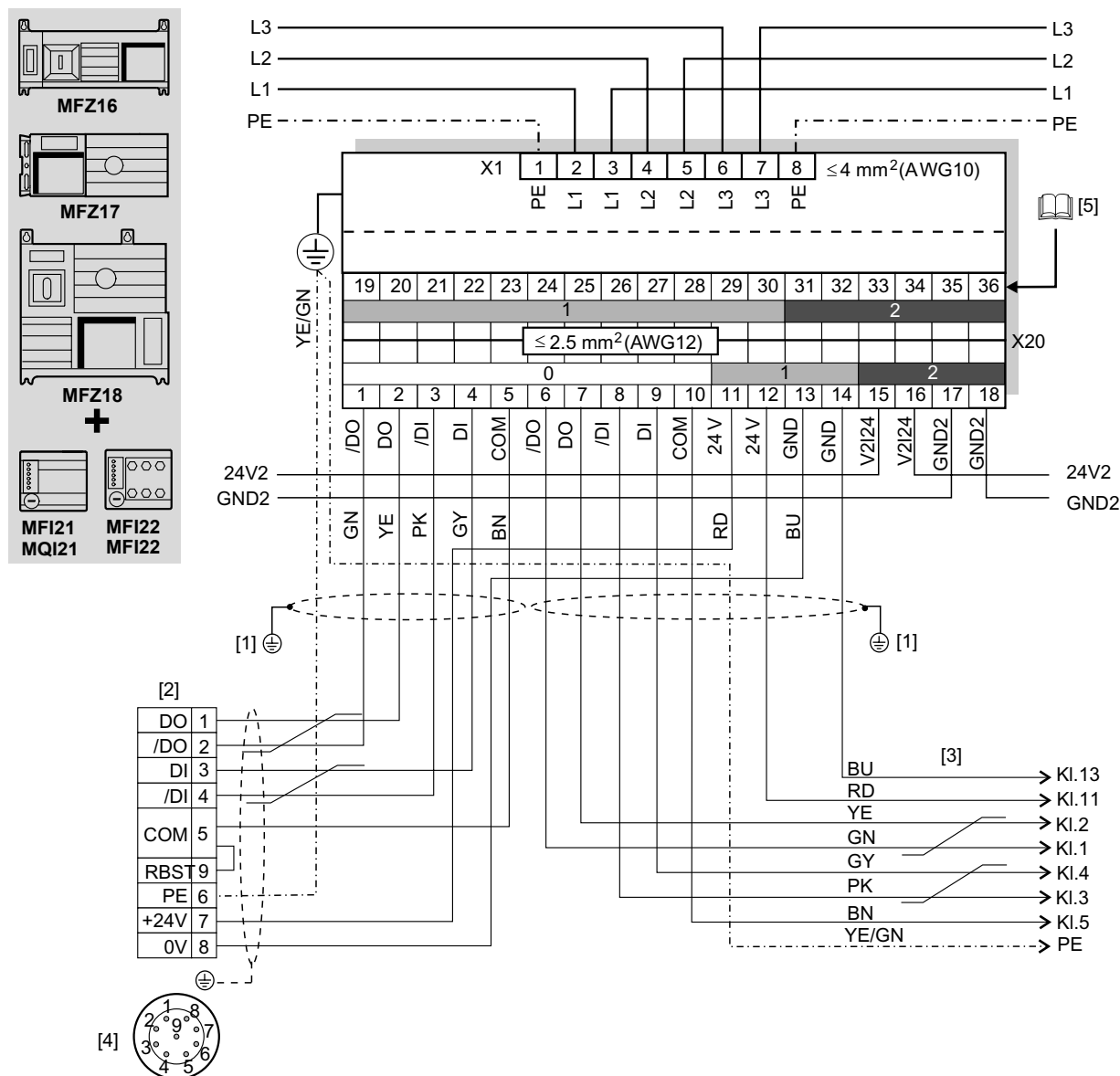


6.3.4 Connection MFZ16, MFZ17, MFZ18 field distributors with MFI../MQI.. INTERBUS interfaces (installation remote bus connection)

Line type CCO-I IP65 round connector → MFI../MQI.. terminals
→ MFI

A special INTERBUS installation remote bus terminal is required to open an installation remote bus segment. The installation remote bus can be connected to this bus terminal (e.g. type IBS IP CBK 1/24F) using an IP65 round plug connector (type CCO-I).

MFZ16, MFZ17, MFZ18 connection module with MFI21/MQI21, MFI22/MQI22 INTERBUS interface



1361521547

0 = Potential level 0 **1** = Potential level 1 **2** = Potential level 2

[1] EMC metal cable gland

[2] Incoming installation remote bus cable

[3] Outgoing installation remote bus cable

[4] IP65 round connector

[5] Assignment of terminals 19 - 36 as described in chapter "Connection of fieldbus interface inputs/outputs (I/O)" (see page 64).



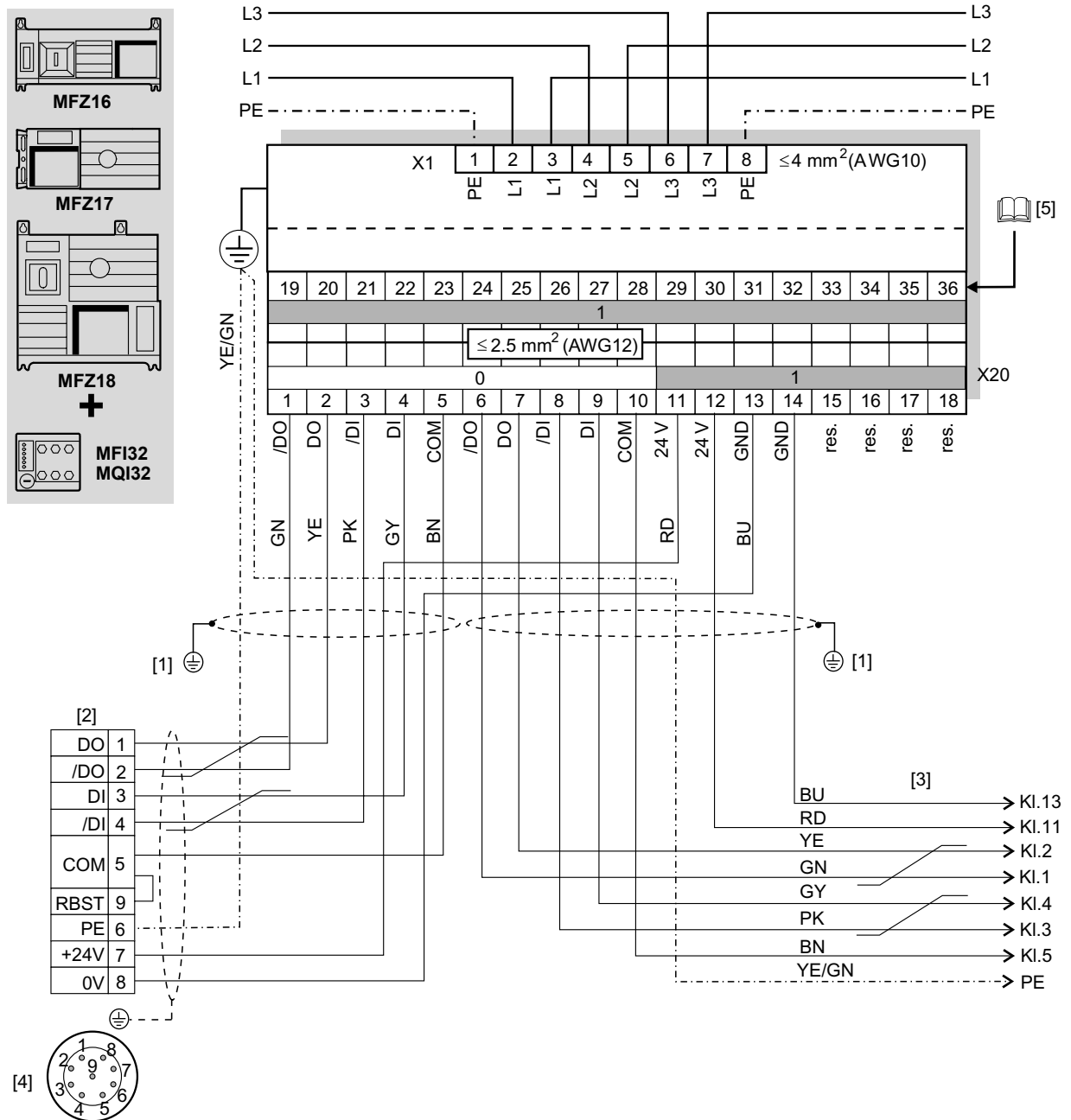
Electrical Installation

Connection with INTERBUS (copper line)

Terminal assignment				
No.		Name	Direction	Function
X20	1	/DO	Input	Incoming remote bus, negated data send direction (green)
	2	DO	Input	Incoming remote bus, data send direction (yellow)
	3	/DI	Input	Incoming remote bus, negated data reception direction (pink)
	4	DI	Input	Incoming remote bus, data reception direction (gray)
	5	COM	-	Reference potential (brown)
	6	/DO	Output	Outgoing remote bus, negated data send direction (green)
	7	DO	Output	Outgoing remote bus, data send direction (yellow)
	8	/DI	Output	Outgoing remote bus, negated data reception direction (pink)
	9	DI	Output	Outgoing remote bus, data reception direction (gray)
	10	COM	-	Reference potential (brown)
	11	24 V	Input	24 V voltage supply for module electronics and sensors
	12	24 V	Output	24 V voltage supply (jumpersed with terminal X20/11)
	13	GND	-	0V24 reference potential for module electronics and sensors
	14	GND	-	0V24 reference potential for module electronics and sensors
	15	V2I24	Input	24 V voltage supply for actuators (digital outputs)
	16	V2I24	Output	24 V voltage supply for actuators (digital outputs) jumpered with terminal X20/15
	17	GND2	-	0V24 reference potential for actuators
	18	GND2	-	0V24 reference potential for actuators



MFZ16, MFZ17, MFZ18 connection module with MFI32/MQI32 INTERBUS interface



1361594891

0 = Potential level 0 1 = Potential level 1

- [1] EMC metal cable gland
- [2] Incoming installation remote bus cable
- [3] Outgoing installation remote bus cable
- [4] IP65 round connector
- [5] Assignment of terminals 19 - 36 as described in chapter "Connection of fieldbus interface inputs/outputs (I/O) (see page 64)".



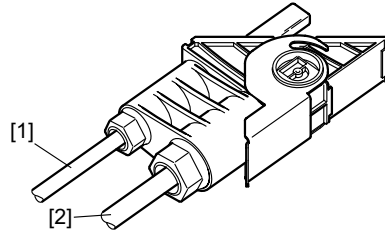
Terminal assignment				
No.		Name	Direction	Function
X20	1	/DO	Input	Incoming remote bus, negated data send direction (green)
	2	DO	Input	Incoming remote bus, data send direction (yellow)
	3	/DI	Input	Incoming remote bus, negated data reception direction (pink)
	4	DI	Input	Incoming remote bus, data reception direction (gray)
	5	COM	-	Reference potential (brown)
	6	/DO	Output	Outgoing remote bus, negated data send direction (green)
	7	DO	Output	Outgoing remote bus, data send direction (yellow)
	8	/DI	Output	Outgoing remote bus, negated data reception direction (pink)
	9	DI	Output	Outgoing remote bus, data reception direction (gray)
	10	COM	-	Reference potential (brown)
	11	24 V	Input	24 V voltage supply for module electronics and sensors
	12	24 V	Output	24 V voltage supply (jumped with terminal X20/11)
	13	GND	-	0V24 reference potential for module electronics and sensors
	14	GND	-	0V24 reference potential for module electronics and sensors
	15	-	-	Reserved
	16	-	-	Reserved
	17	-	-	Reserved
	18	-	-	Reserved



6.4 Connecting INTERBUS with fiber-optic cable

6.4.1 Connecting the communication and the DC 24 V voltage supply

INTERBUS and the DC 24 V supply are installed using rugged line connectors.



1361730571

- [1] Fiber optic cable (INTERBUS remote bus)
[2] VS1/VS2 voltage supply

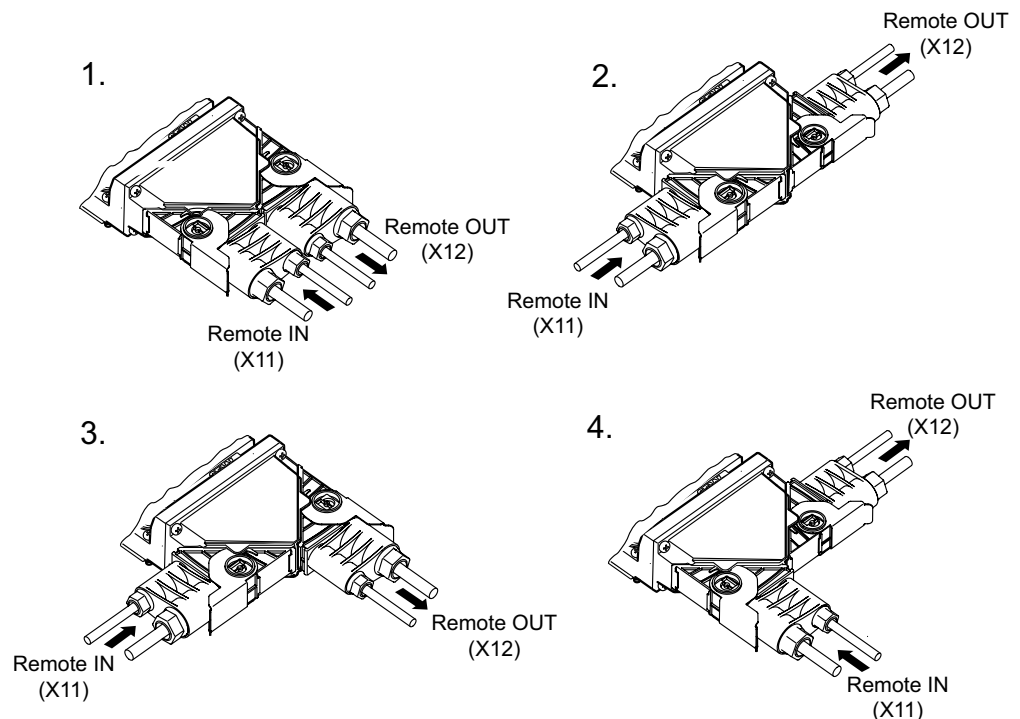


TIPS

- The connectors are not included in the SEW delivery. They are available from Phoenix Contact.
- It is essential to observe the project planning and installation guidelines for the rugged-line connection technology by Phoenix-Contact.

6.4.2 Assembling the bus connector

The connector plugs can be connected to the bus module in 4 different ways (see the following figure).



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⚠ WARNING

Assembling the connectors when energized.

Damage due to overvoltage or short circuit.

Only install the connector plugs when they are de-energized. Prior to assembling the connectors disconnect the voltage supply.



⚠ WARNING

Improper handling of the connector clips.

Damage to the clip.

Do not use the clips to position the connectors on the bus module. Hold the connectors by the housing to plug them in.

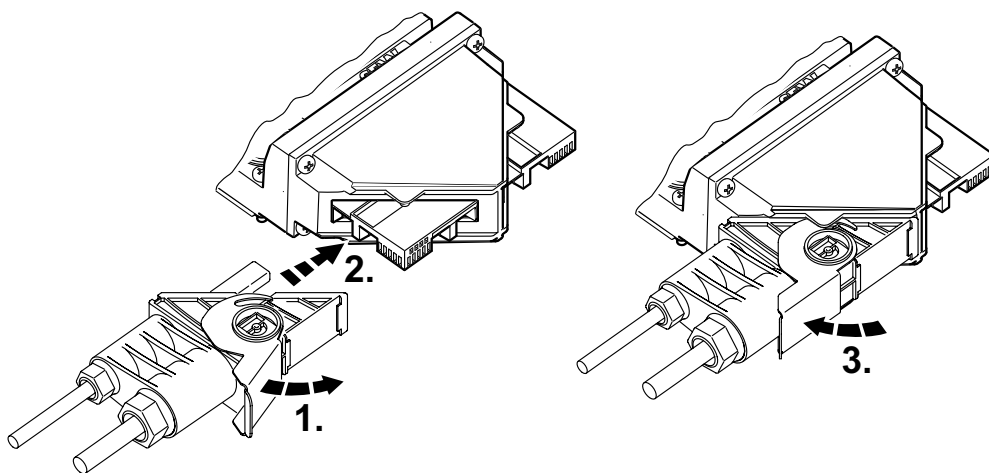


TIP

Connector plugs that are not in use must be equipped with a dummy plug to ensure the enclosure.

Assembly

- Disconnect the voltage supply.
- Open the clip (1.) and push the plug all the way into the corresponding socket on the bus module (2.)
- Close the clip (3.)



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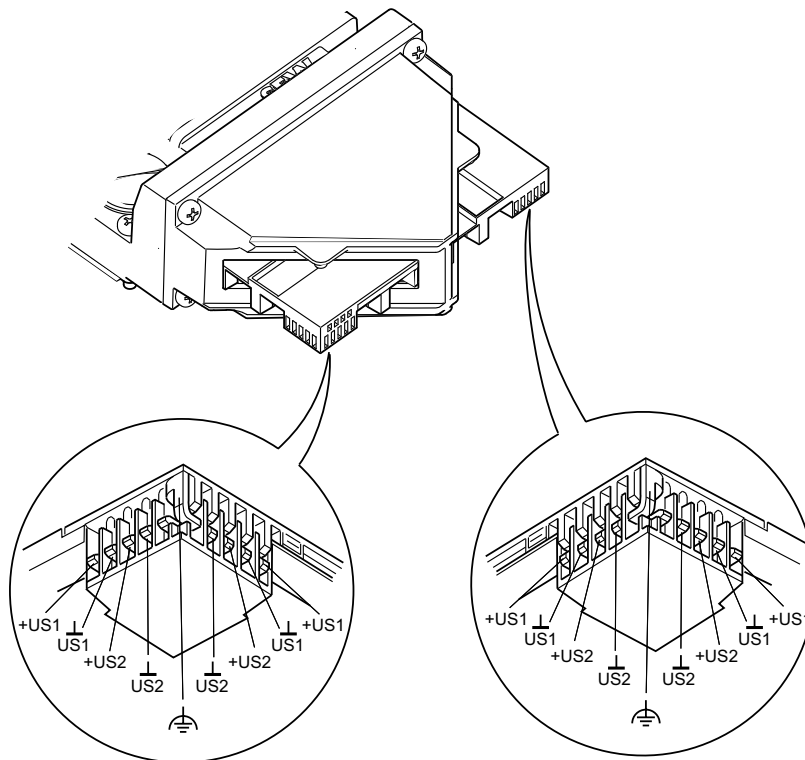
Disassembly

- Disconnect the voltage supply.
- Open the clip and pull the plug from the module.

6.4.3 Supply voltage

- The two available supply voltages are used as follows:
 - VS1: DC 24 V power supply for bus logic, sensors and MOVIMOT®
 - VS2: Power supply for the actuators (for current consumption, see Technical Data)

Pin assignment

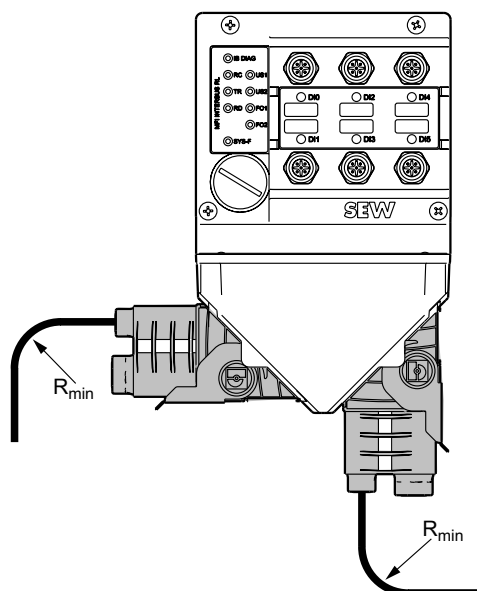


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6.4.4 Cable installation

Cabling for the plug connectors requires maintaining a distance that is dependent on the bending radius of the cable type being used (observe the project planning and installation guidelines concerning rugged line connection technology from Phoenix-Contact).



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Cable lengths < 1 m



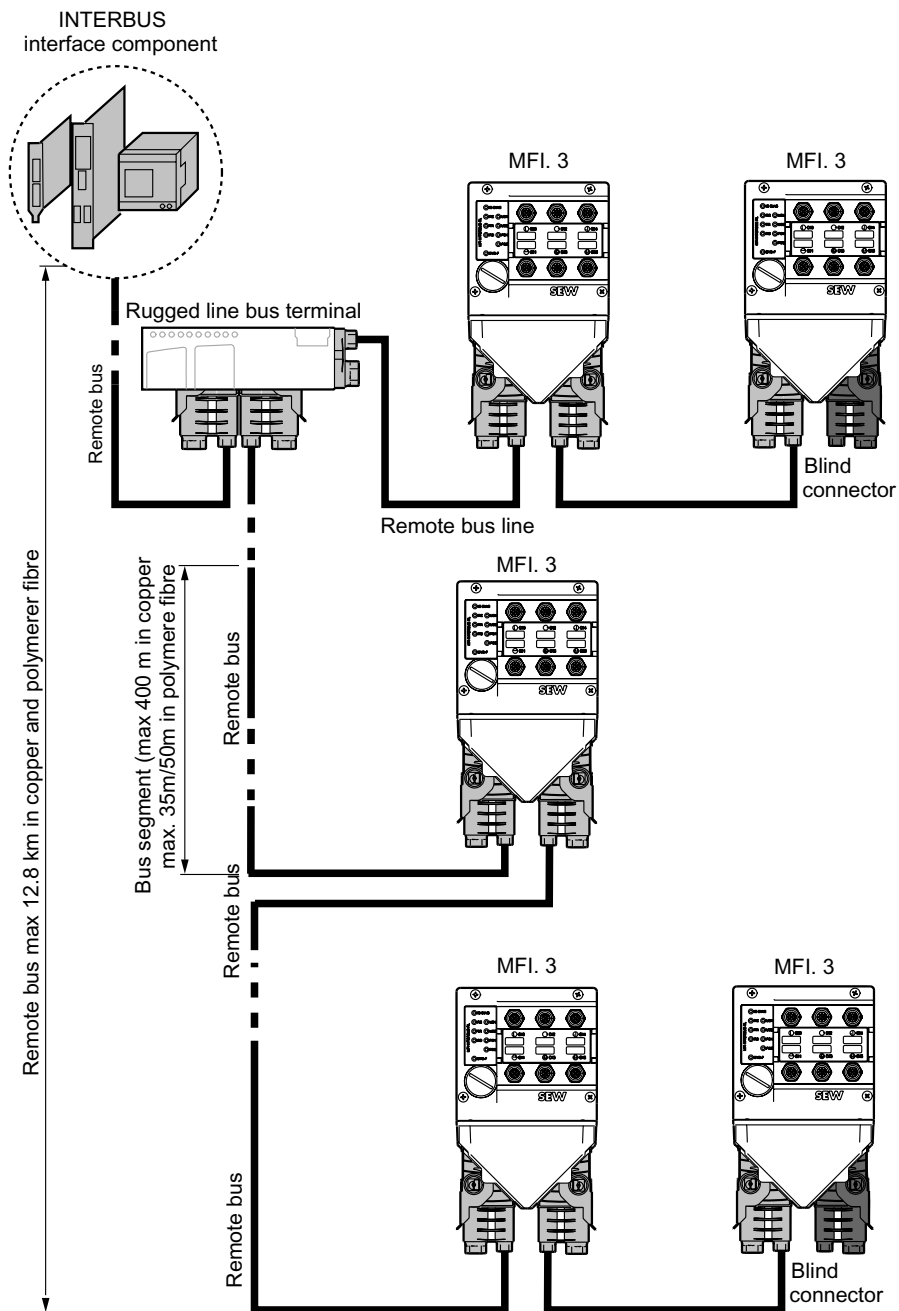
TIP

Cable lengths < 1 m are only permitted with the pre-fabricated IBS RL CONNECTION-LK special cable bridge from Phoenix Contact.

Observe the project planning and installation guidelines for the rugged-line connection technology by Phoenix-Contact.



6.4.5 Sample topology of an INTERBUS design with rugged line connection



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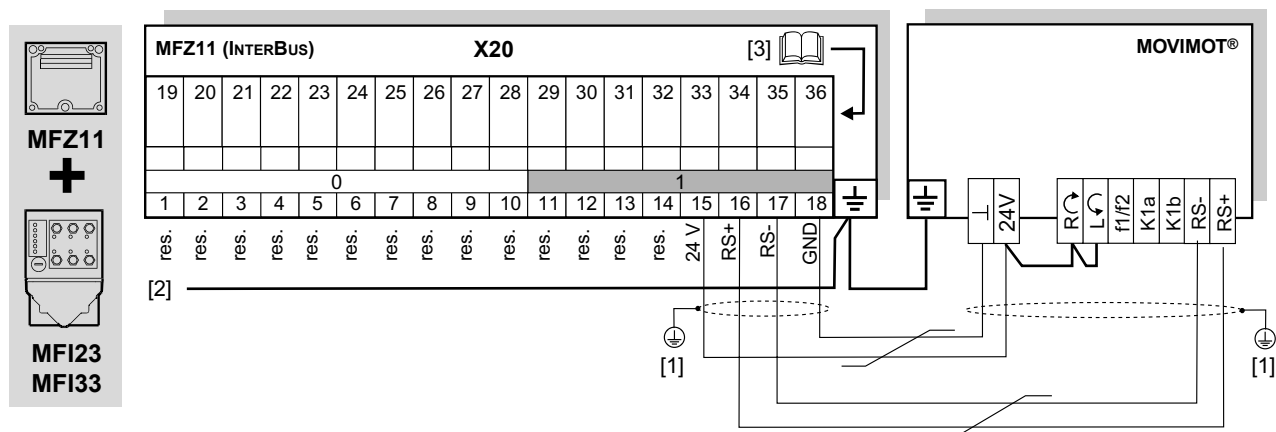


TIP

The maximum distance between two remote bus nodes connected via fibre optic cables with fixed polymer fibers is 50 m. With flexible polymer fibers, the maximum distance is 35 m.



6.4.6 Connecting the MFZ11 connection module to MOVIMOT® with MFI23/MFI33 INTERBUS interface



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0 = Potential level 0

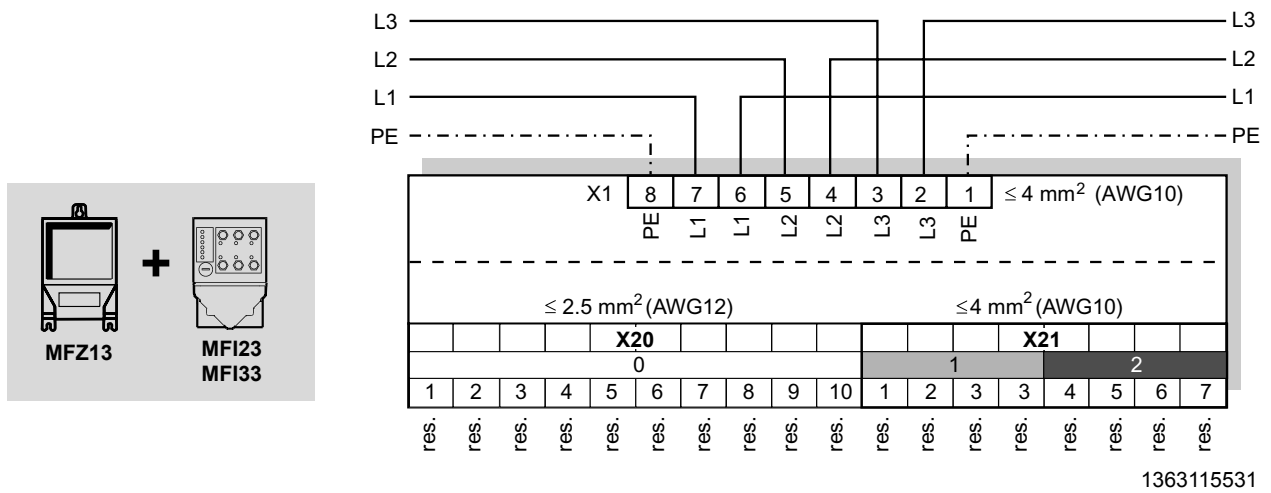
1 = Potential level 1

- [1] For separate MFZ11/MOVIMOT® installation:
Connect the shield of the RS-485 cable with MFZ and the MOVIMOT® housing using the EMC metal cable gland
- [2] Ensure equipotential bonding between all bus stations
- [3] Assignment of terminals 19 - 36 as described in chapter "Connection of fieldbus interface inputs/outputs (I/O) (see page 64)".

Terminal assignment			
No.	Name	Direction	Function
X20	1 - 14	–	Reserved
	15	24 V	Output
	16	RS+	Output
	17	RS-	Output
	18	GND	–
			0V24 reference potential for MOVIMOT® (jumped with terminal X20/13)

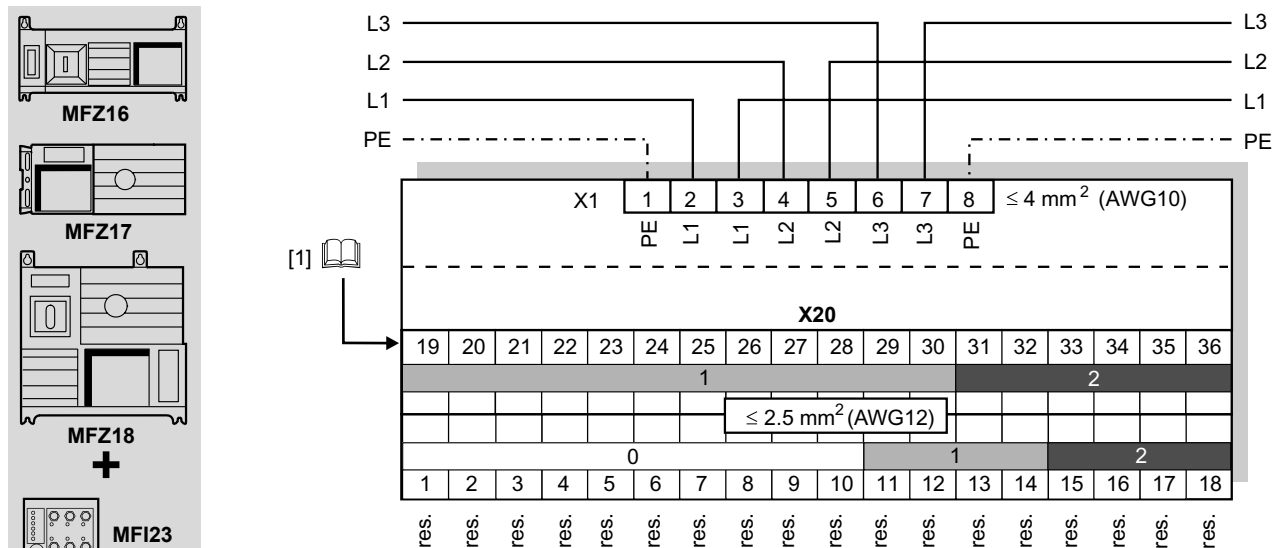


6.4.7 Connecting the MFZ13 field distributor with MFI23/MFI33



0 = Potential level 0 1 = Potential level 1 2 = Potential level 2

6.4.8 Connecting the MFZ16, MFZ17, MFZ18 field distributor with MFI23/MFI33



0 = Potential level 0 1 = Potential level 1 2 = Potential level 2

[1] Assignment of terminals 19 - 36 as described in chapter "Connection of fieldbus interface inputs/outputs (I/O) (see page 64)".



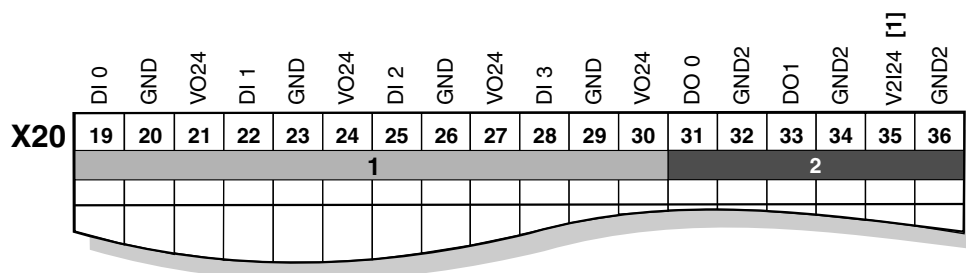
6.5 Connection of MF../MQ.. fieldbus interface inputs/outputs (I/O)

The power supply to the fieldbus interfaces is connected via terminals or M12 plug connectors.

6.5.1 Connecting the fieldbus interfaces via terminals

Fieldbus interfaces with 4 digital inputs and 2 digital outputs:

MFZ.1	in combination with	MF.21	MQ.21
MFZ.6		MF.22	MQ.22
MFZ.7		MF.23	
MFZ.8			



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[1] Only MFI23: reserved, all other MF.. modules: V2I24

1	= Potential level 1
2	= Potential level 2

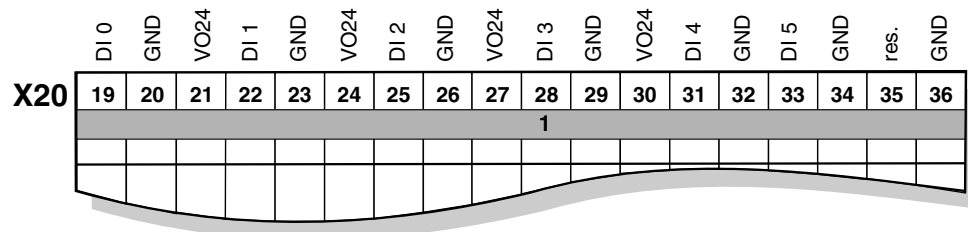
No.	Name	Direction	Function
X20	19	DI0	Input
	20	GND	-
	21	VO24	Output
	22	DI1	Input
	23	GND	-
	24	VO24	Output
	25	DI2	Input
	26	GND	-
	27	VO24	Output
	28	DI3	Input
	29	GND	-
	30	VO24	Output
	31	DO0	Output
	32	GND2	-
	33	DO1	Output
	34	GND2	-
	35	V2I24	Input
	36	GND2	-

1) Used in conjunction with field distributors MFZ26J and MFZ28J for maintenance switch feedback signal (NO contact). Evaluation via control is possible.



Fieldbus interfaces with 6 digital inputs:

MFZ.1			
MFZ.6	in combination with	MF.32	MQ.32
MFZ.7		MF.33	
MFZ.8			



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1 = Potential level 1

No.	Name	Direction	Function
X20 19	DI0	Input	Control signal of sensor 1 ¹⁾
20	GND	-	0V24 reference potential for sensor 1
21	V024	Output	24 V voltage supply for sensor 1 ¹⁾
22	DI1	Input	Control signal of sensor 2
23	GND	-	0V24 reference potential for sensor 2
24	V024	Output	24 V voltage supply for sensor 2
25	DI2	Input	Control signal of sensor 3
26	GND	-	0V24 reference potential for sensor 3
27	V024	Output	24 V voltage supply for sensor 3
28	DI3	Input	Control signal of sensor 4
29	GND	-	0V24 reference potential for sensor 4
30	V024	Output	24 V voltage supply for sensor 4
31	DI4	Input	Control signal of sensor 5
32	GND	-	0V24 reference potential for sensor 5
33	DI5	Input	Control signal of sensor 6
34	GND	-	0V24 reference potential for sensor 6
35	res.	-	Reserved
36	GND	-	0V24 reference potential for sensors

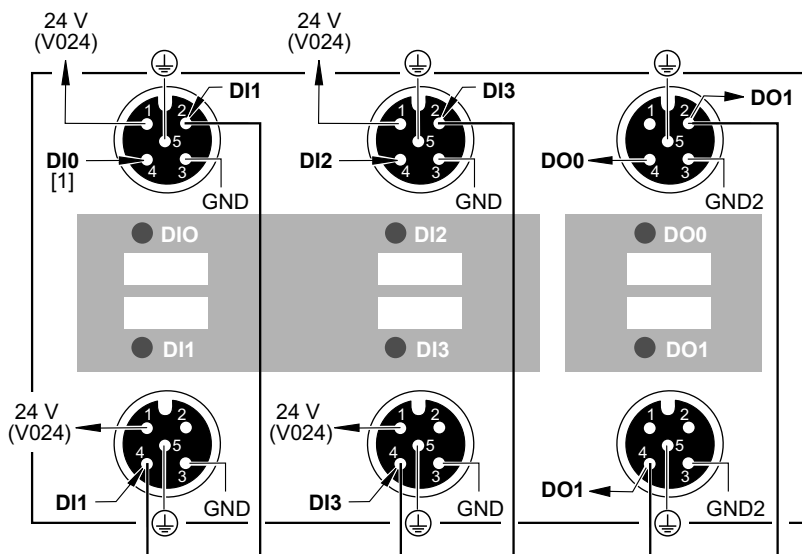
1) Used in conjunction with field distributors MFZ26J and MFZ28J for maintenance switch feedback signal (NO contact). Evaluation via control is possible.



6.5.2 Connecting the fieldbus interfaces via M12 plug connector

MF.22, MQ.22, MF.23 fieldbus interfaces with 4 digital inputs and 2 digital outputs:

- Connect sensors/actuators using either M12 sockets or terminals
- When using outputs: Connect 24 V to V2I24 / GND2
- Connect dual-channel sensors/actuators to DI0, DI2 and DO0. DI1, DI3 and DO1 can no longer be used.



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[1] Do not use DI0 in combination with field distributors MFZ26J and MFZ28J.



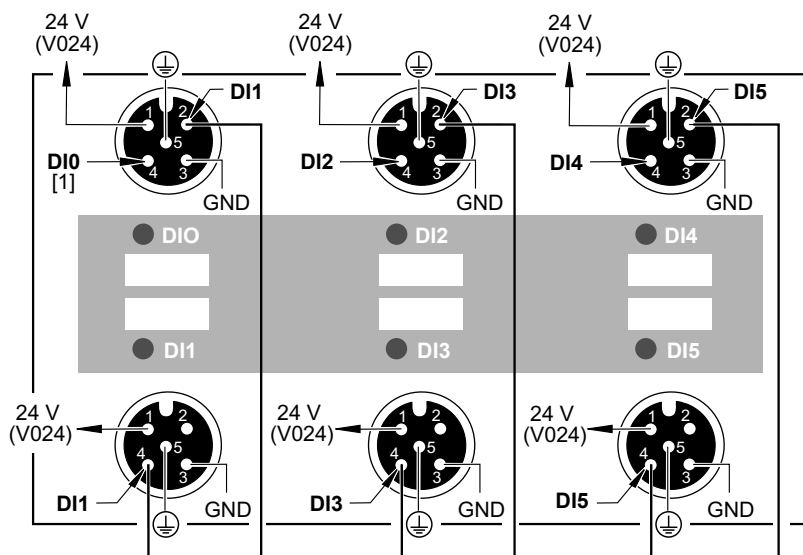
TIP

Connections that are not in use must be covered with M12 closing caps to guarantee degree of protection IP65.



MF.32, MQ.32, MF.33 fieldbus interfaces with 6 digital inputs:

- Connect sensors using either M12 sockets or terminals.
- Connect dual-channel sensors to DI0, DI2 and DI4. DI1, DI3 and DI5 can no longer be used.



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[1] Do not use DI0 in combination with field distributors MFZ26J and MFZ28J.

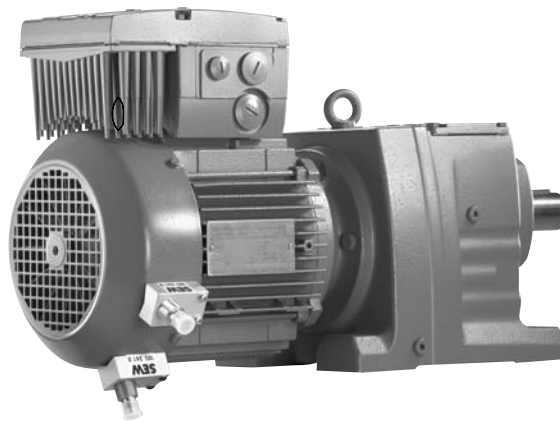


6.6 NV26 proximity sensor connection

6.6.1 Characteristics

The NV26 proximity sensor offers the following features:

- 6 pulses / revolution
- 24 increments/revolution with 4-fold evaluation
- Encoder monitoring and evaluation is possible with MQ.. fieldbus interface
- Signal level: HTL

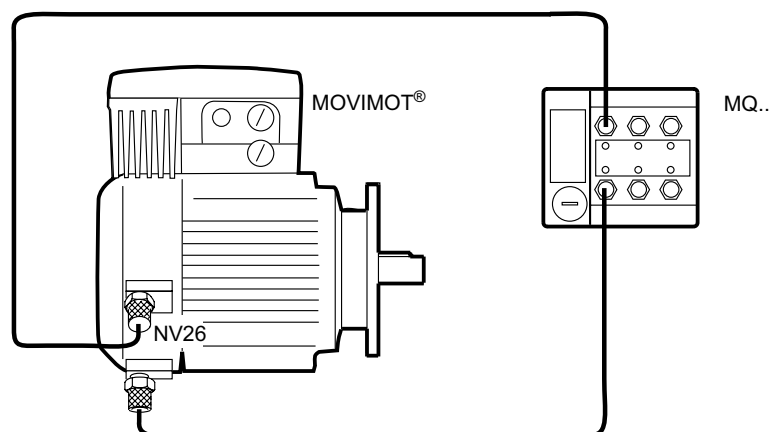


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For constructive reasons, the angle between the sensors is 45°.

6.6.2 Connection

- Use a shielded M12 cable to connect the NV26 proximity sensor to the DI0 and DI1 inputs of the MQ.. fieldbus interface.



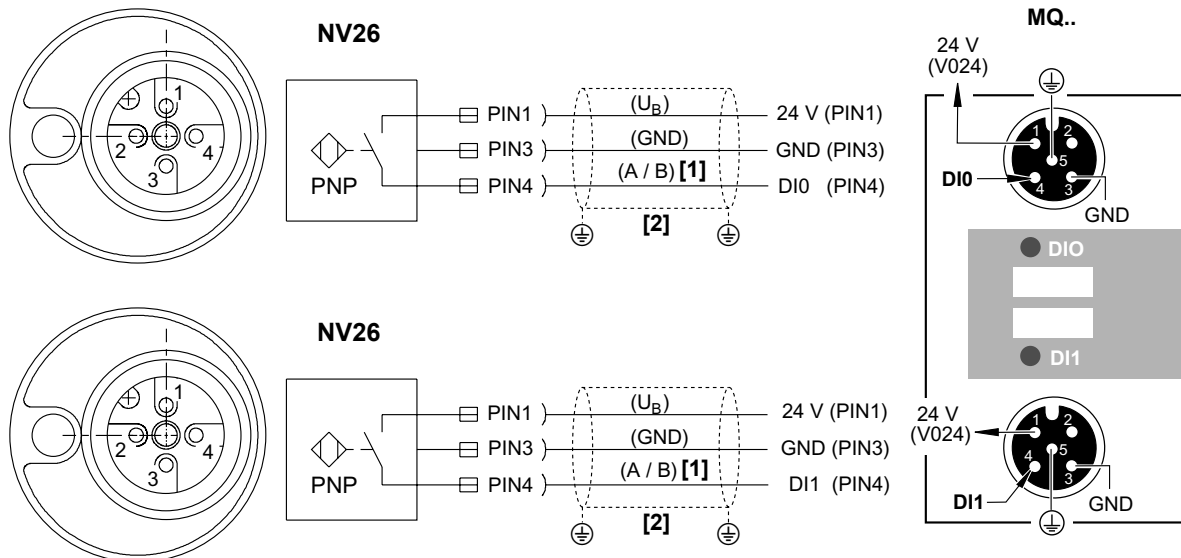
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- The current position can be checked by reading IPOS variable H511 (ActPosMot).
- SEW-EURODRIVE recommends activating the encoder monitoring function using parameter "P504 Encoder monitoring motor".



6.6.3 Wiring diagram

The following figure shows the pin assignment of NV25 sensors to the MQ.. fieldbus interface:

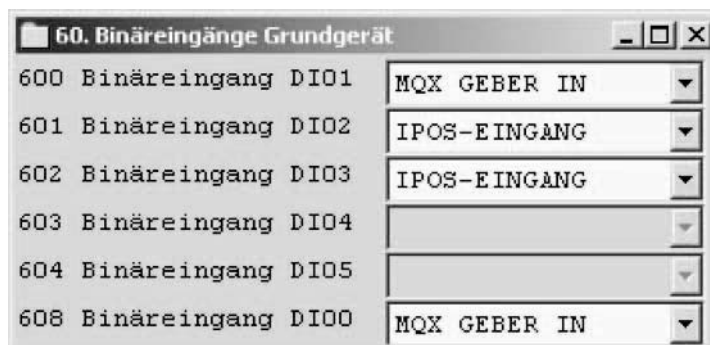


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- [1] Encoder input track A or track B
[2] Shielding

6.6.4 Encoder evaluation

The inputs of the MQ.. fieldbus interface are filtered with 4 ms according to the factory setting. The terminal assignment "MQX ENCODER IN" switches this filter off for sensor evaluation.



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TIP

For more information, refer to the "IPOS^{plus}® positioning and sequence control" manual, section "IPOS for MQX", under "Proximity sensor evaluation".



6.7 Connection of ES16 incremental encoder

6.7.1 Characteristics

The ES16 incremental encoder offers the following features:

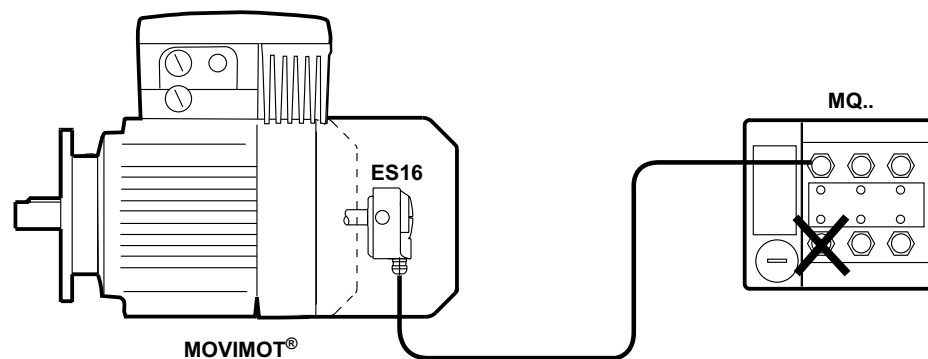
- 6 pulses / revolution
- 24 increments/revolution with 4-fold evaluation
- Encoder monitoring and evaluation is possible with MQ.. fieldbus interface
- Signal level: HTL



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6.7.2 Installation in combination with MQ.. fieldbus interface

- Connect the ES16 incremental encoder to the inputs of the MQ.. fieldbus interface using a shielded M12 cable, section "Wiring diagram" (see page 71).

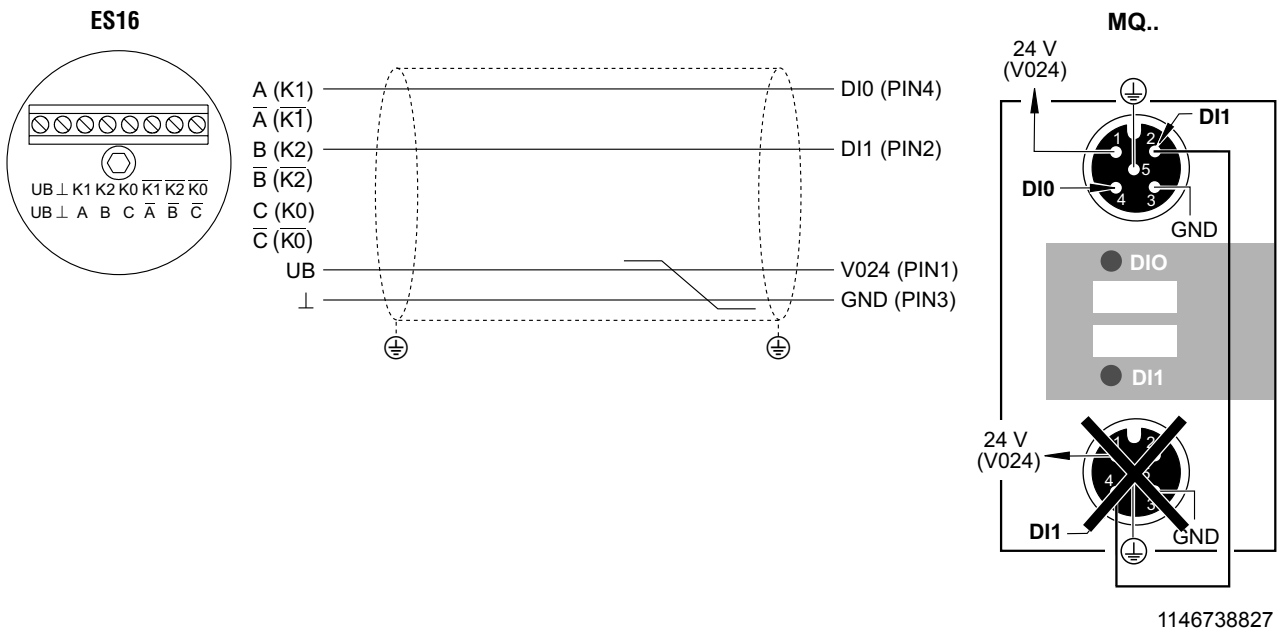


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- The current position can be checked by reading IPOS variable H511 (ActPosMot).
- SEW-EURODRIVE recommends activating the encoder monitoring function using parameter "P504 Encoder monitoring motor".



6.7.3 Wiring diagram

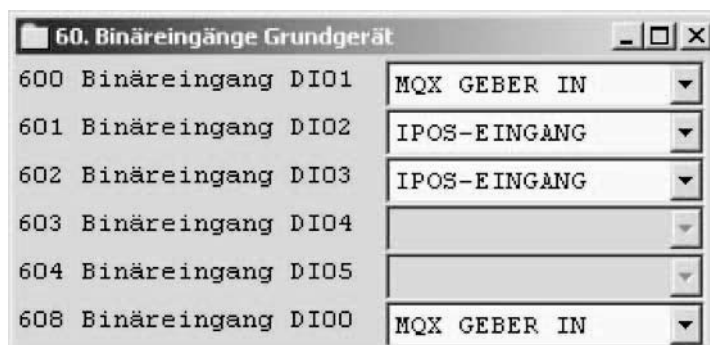


TIP

Do not assign the input socket DI1 more than once.

6.7.4 Encoder evaluation

The inputs of the MQ.. fieldbus interface are filtered with 4 ms according to the factory setting. The terminal assignment "MQX ENCODER IN" switches this filter off for sensor evaluation.



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TIP

For more information, refer to the "IPOS^{plus}® positioning and sequence control" manual, section "IPOS for MQX", under "Proximity sensor evaluation".

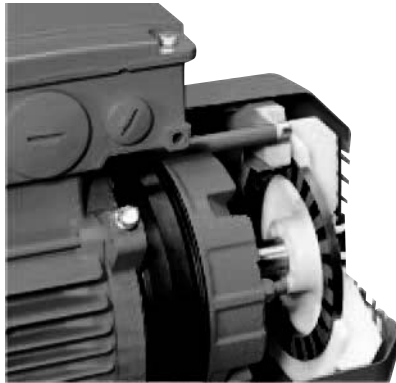


6.8 Connection of EI76 incremental encoder

6.8.1 Characteristics

The EI76 incremental encoder is equipped with Hall probes. It has the following characteristics:

- 6 pulses / revolution
- 24 increments/revolution with 4-fold evaluation
- Encoder monitoring and evaluation is possible with MQ.. fieldbus interface
- Signal level: HTL

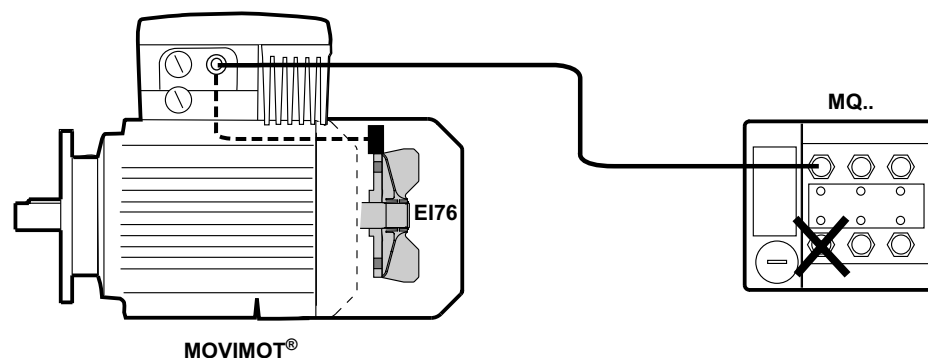


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6.8.2 Fieldbus interface connection

If the MOVIMOT® inverter is mounted to the motor, the built-in EI76 encoder is connected internally to a M12 connector on the connection box of the drive.

- Connect this M12 connection via an M12 cable with the input socket of the MQ.. fieldbus interface (section "Wiring diagram for mounting the inverter to the motor" (see page 73)).



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- The current position can be checked by reading IPOS variable H511 (ActPosMot).
- SEW-EURODRIVE recommends activating the encoder monitoring function using parameter "P504 Encoder monitoring motor".

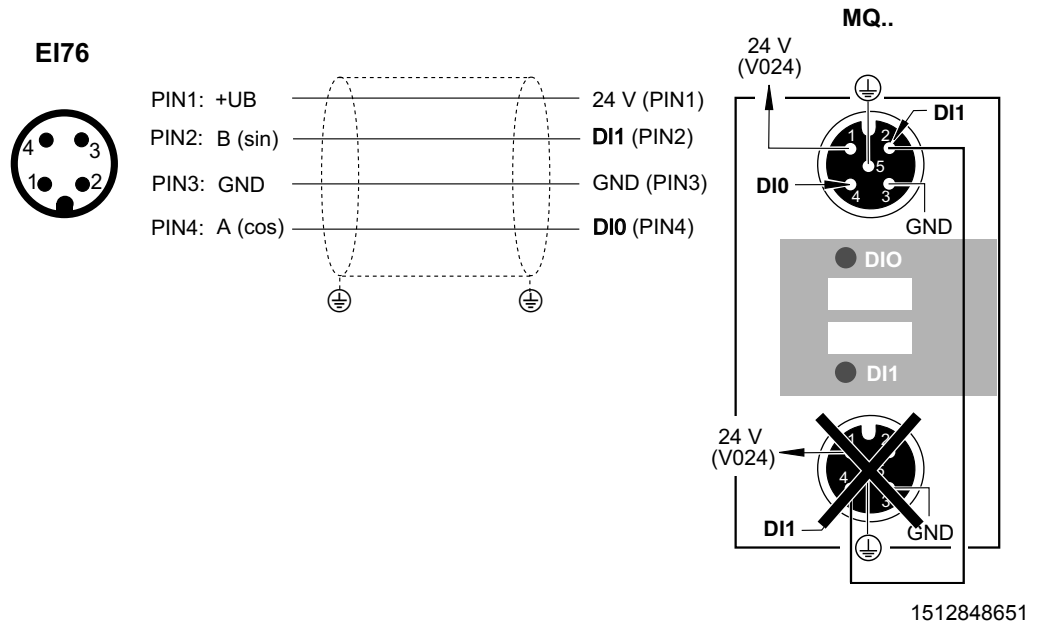


6.8.3 Wiring diagram for mounting the inverter to the motor

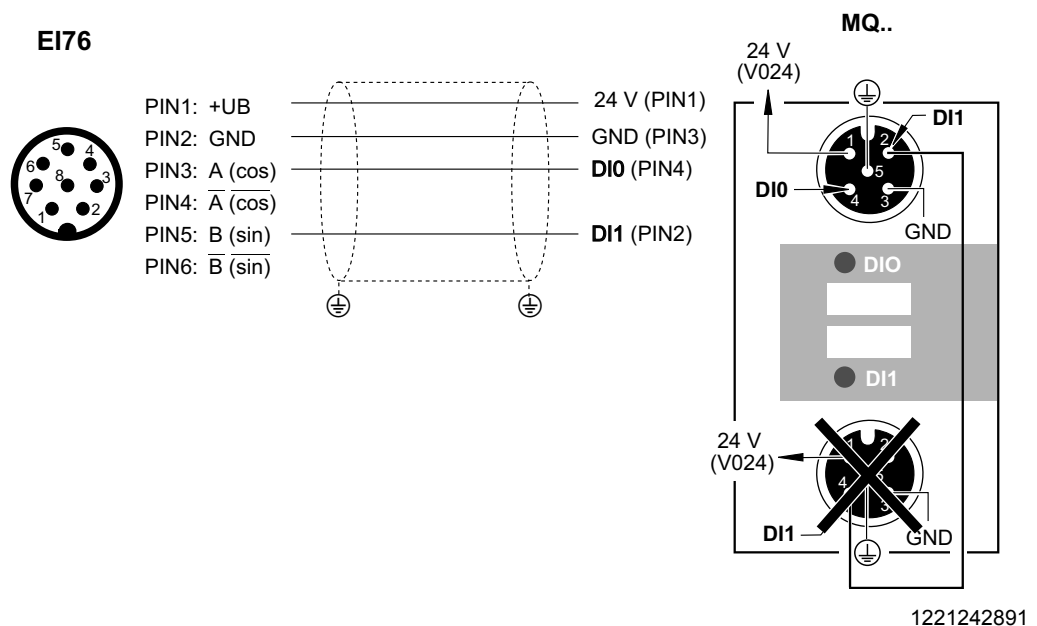
If the MOVIMOT® inverter is mounted on the motor, the encoder is connected to the MQ.. fieldbus interface MQ.. via a shielded M12 cable plugged in on both ends.

There are 2 possible variants:

Variant 1: AVSE



Variant 2: AVRE

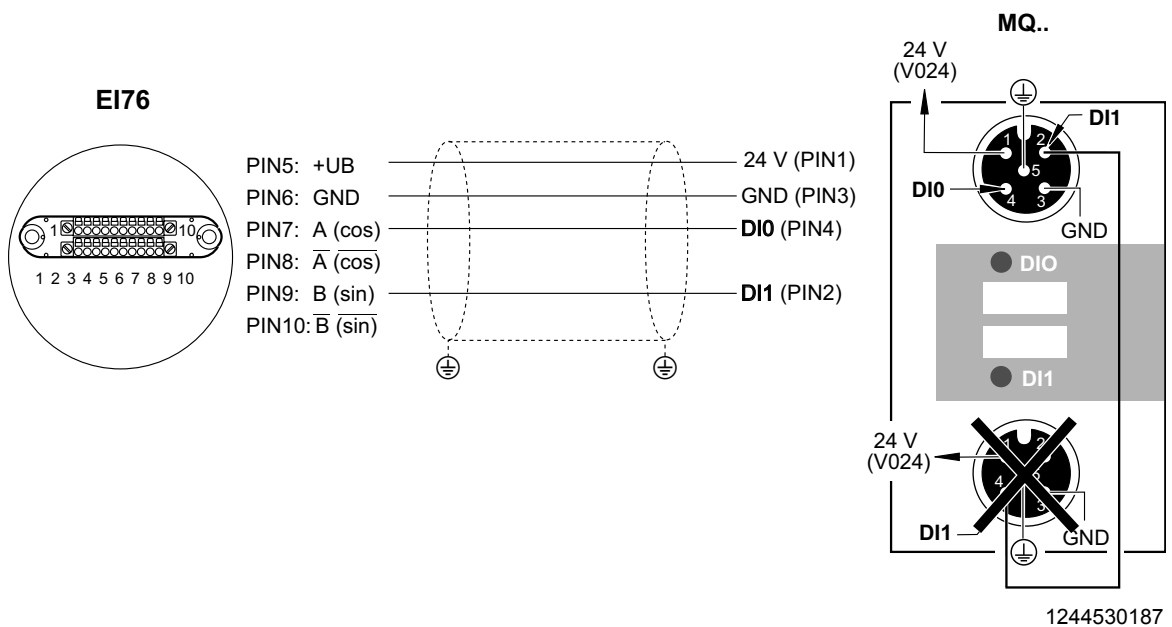


**TIP**

Do not assign the input socket DI1 more than once.

6.8.4 Wiring diagram for mounting the inverter on the field distributor

If the MOVIMOT® inverter is mounted to the field distributor (mounting close to the motor), the shielded cable is connected to the terminals in the connection box of the drive and plugged into the input socket of the MQ.. fieldbus interface.

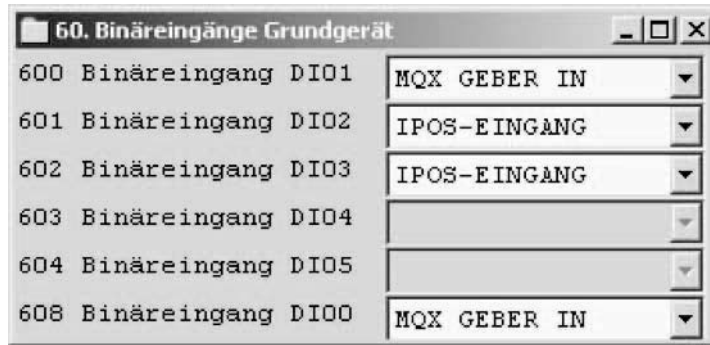
**TIP**

Do not assign the input socket DI1 more than once.



6.8.5 Encoder evaluation

The inputs of the MQ.. fieldbus interface are filtered with 4 ms according to the factory setting. The terminal assignment "MQX ENCODER IN" switches this filter off for sensor evaluation.



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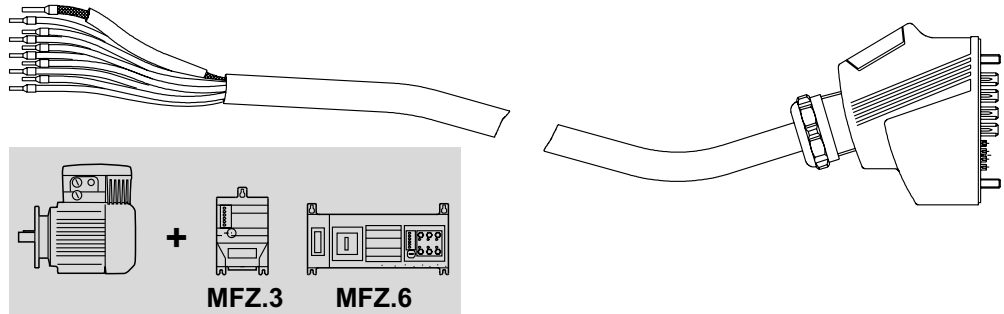
TIP

For more information, refer to the "IPOS^{plus}® positioning and sequence control" manual, section "IPOS for MQX", especially in chapter "Proximity sensor evaluation".



6.9 Hybrid cable connection

6.9.1 Hybrid cable between MFZ.3/MFZ.6. field distributor and MOVIMOT® (part number 0186 725 3)



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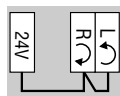
Terminal assignment	
MOVIMOT® terminal	Wire color/hybrid cable designation
L1	Black/L1
L2	Black/L2
L3	Black/L3
24 V	Red / 24 V
⊥	White/0 V
RS+	Orange/RS+
RS-	Green/RS-
PE terminal	Green/yellow + shield end

Note the enabled direction of rotation

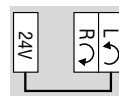


TIP

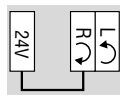
Check to see if requested direction of rotation has been enabled. For detailed information, refer to the "Startup" chapters in the "MOVIMOT® MM..D with DRS/DRE/DRP Series AC Motor" operating instructions.



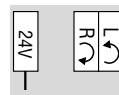
Both directions of rotation are enabled



Only CCW operation is enabled;
Setpoint specifications for CW rotation result in standstill of drive



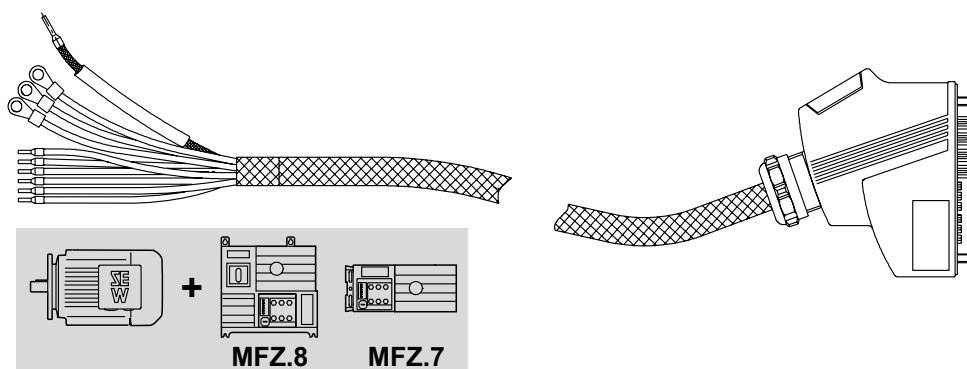
Only CW operation enabled;
Pre-selected setpoints for CCW rotation result in standstill of drive



Drive is inhibited or is being brought to a standstill



6.9.2 Hybrid cable between MFZ.7./ MFZ.8. field distributor and AC motors (part number 0 186 742 3)



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TIP

The outer shield of the cable must be attached to the housing of the motor terminal box using an EMC metal cable gland.

Terminal assignment	
Motor terminal	Wire color/hybrid cable designation
U1	Black/U1
V1	Black/V1
W1	Black/W1
4a	Red/13
3a	White/14
5a	Blue/15
1a	Black/1
2a	Black/2
PE terminal	Green/yellow + shield end (internal shield)



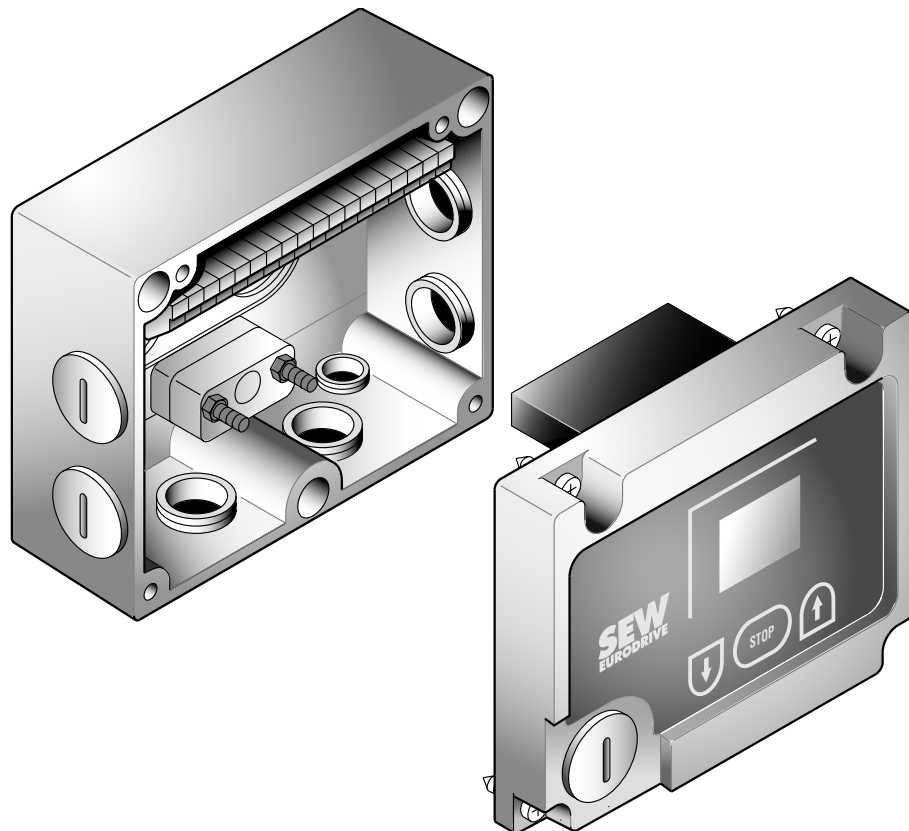
6.10 Keypad connection

The keypads MFG11A or DBG can be used for manual control. The DBG keypad offers additional parameter setting, diagnostic and monitoring functions.

For information about functions and operation of the keypads, refer to chapter "Keypads (see page 145)".

6.10.1 Connection of the MFG11A keypad

The MFG11A keypad is connected to any MFZ.. connection module instead of a fieldbus interface.

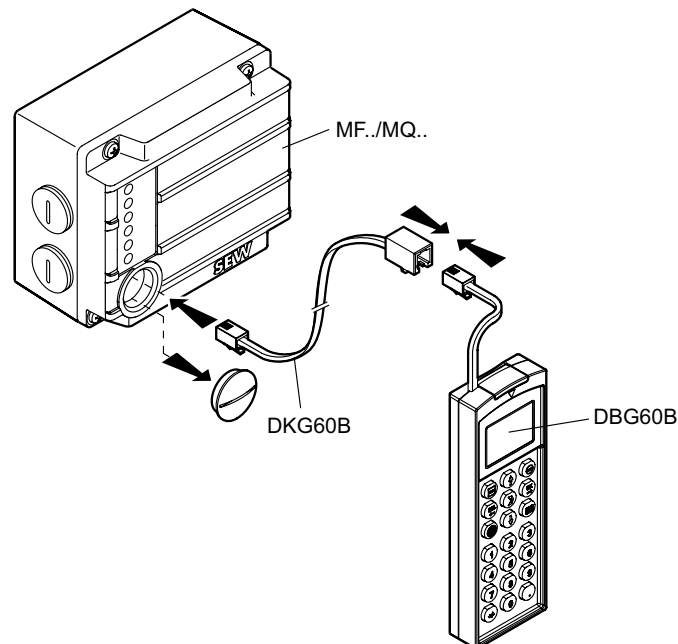


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6.10.2 Connection of the DBG keypad

The DBG60B keypad is connected directly to the diagnostic interface of the MF../MQ.. fieldbus interface. You can also connect the keypad via a 5 m extension cable (DKG60B option).



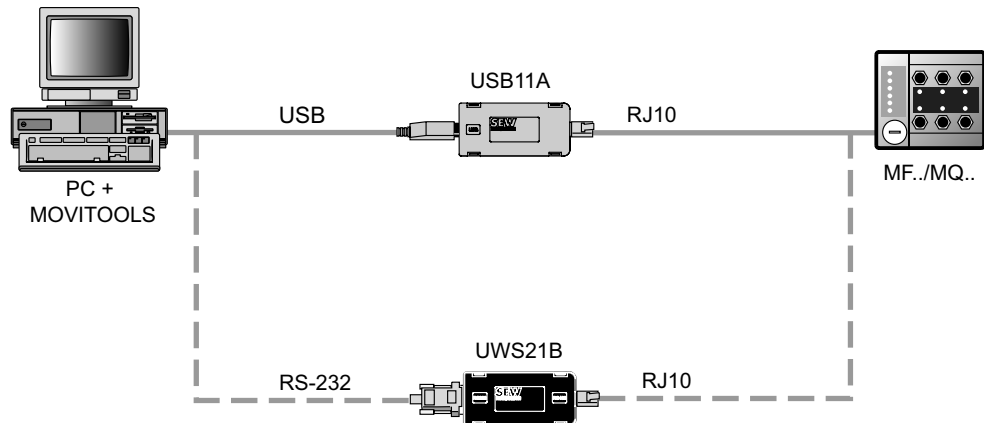
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6.11 PC connection

The diagnostic interface can be connected to a PC using one of the following options:

- USB11A with USB interface, part number 0 824 831 1 or
- UWS21B with serial interface RS-232, part number 1 820 456 2



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Scope of delivery:

- Interface adapter
- Cable with RJ10 plug connector
- Interface cable USB (USB11A) or RS-232 (UWS21B)



7 Startup with MFI.. INTERBUS Interface (Copper Line)

7.1 Startup procedure

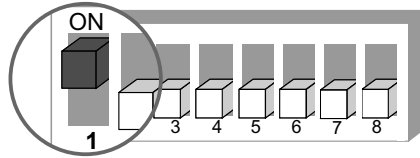
	TIP This chapter describes the startup procedure for MOVIMOT® MM..D and C in Easy mode. For information on the startup of MOVIMOT® MM..D in Expert mode, refer to the "MOVIMOT® MM..D with DRS/DRE/DRP Series AC Motors" operating instructions.
	! DANGER Before removing/fitting the MOVIMOT® inverter, you must disconnect it from the supply system. Dangerous voltages may still be present for up to one minute after disconnection from the power supply. Severe or fatal injuries from electric shock. • Disconnect the MOVIMOT® inverter from the power supply and prevent it from unintentional re-connection. • Then wait for at least 1 minute.
	! WARNING The surfaces of MOVIMOT® inverters and external options, e.g. braking resistors (especially the heat sinks), can become very hot during operation. Danger of burns. • Do not touch the MOVIMOT® drive and external options until they have cooled down sufficiently.
	TIPS • Switch off the DC 24 V supply before removing/mounting the housing cover (MFI). • Removal of the housing cover interrupts the ring structure of the INTERBUS. This means the entire bus system is no longer operational! • In addition, observe the notes in section "Supplementary Field Distributor Startup Information (see page 138)".
	TIPS • Remove paint protection cap from the status LED before startup. • Remove paint protection film from the nameplates before startup. • Check that all protective covers are installed correctly. • Observe a minimum switch-off time of 2 seconds for the mains contactor K11.



Startup with MFI.. INTERBUS Interface (Copper Line)

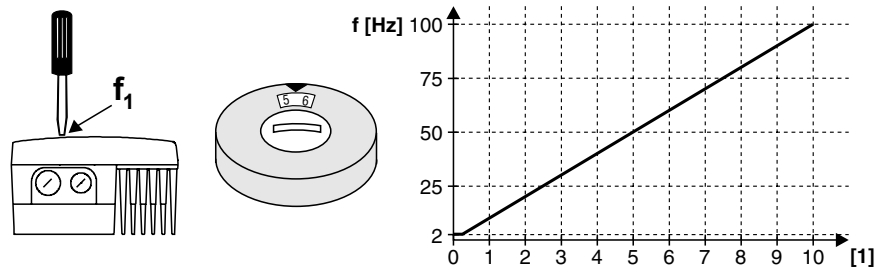
Startup procedure

1. Verify correct connection of the MOVIMOT® and INTERBUS connection module (MFZ11, MFZ13, MFZ16, MFZ17 or MFZ18).
2. Set DIP switch S1/1 of the MOVIMOT® inverter (see corresponding MOVIMOT® operating instructions) to "ON" (= address 1).



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3. Unscrew the screw plug above the setpoint potentiometer f1 on the MOVIMOT® inverter.
4. Set the maximum speed using setpoint potentiometer f1.



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[1] Potentiometer setting

5. Make sure the screw plug of the setpoint potentiometer has a seal and screw it in.



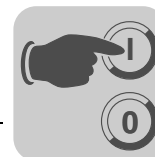
TIP

- The degree of protection specified in section Technical Data only applies if the screw plugs of the setpoint potentiometer and the X50 diagnostic interface are installed correctly.
- A missing or incorrectly installed screw plug can cause damage to the MOVIMOT® inverter.



6. Set minimum frequency $f_{\min}$ with switch f2.

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Minimum frequency $f_{\min}$ [Hz]	2	5	7	10	12	15	20	25	30	35	40



7. If the ramp time is not specified via fieldbus (2 PD), set the ramp time at switch t1 of the MOVIMOT® inverter. The ramp times are based on a setpoint step change of 50 Hz.

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Ramp time t1 [s]	0.1	0.2	0.3	0.5	0.7	1	2	3	5	7	10

8. Check to see if requested direction of rotation has been enabled on MOVIMOT®.

Terminal R	Terminal L	Meaning
Activated	Activated	Both directions of rotation are enabled
Activated	Not activated	- Only CW operation enabled - Pre-selected setpoints for CCW rotation result in standstill of drive
Not activated	Activated	- Only CCW operation enabled - Pre-selected setpoints for CW rotation result in standstill of drive
Not activated	Not activated	Unit is blocked or drive brought to a stop

9. Set the MFI DIP switch as described in chapter "DIP switch setting (see page 84)".
10. Put the MOVIMOT® inverter and the MFI housing cover into place and screw them together.
11. Switch on the DC 24 V supply voltage for the MFI INTERBUS interface and the MOVIMOT® inverter. The "UL" and "RD" LEDs of the MFI should now light up and the red "SYS-F" LED should go out. If this is not the case, you can localize potential wiring or setting errors via the LED statuses as described in chapter "Meaning of the LED display (see page 92)".
12. Project the MFI INTERBUS interface in the INTERBUS master according to chapter "Configuring (projecting) the INTERBUS master (see page 86)".



7.2 MFI DIP switch settings

MFI DIP switches 1 to 6 make it possible to set the MOVIMOT® process data width, the MFI operating mode and the physical continuation of the ring circuit.

7.2.1 Process data length, operating mode

The process data length for MOVIMOT® is set via DIP switches 1 and 2. The MFI INTERBUS interface for MOVIMOT® supports the process data length 2 PD and 3 PD. You can select an additional word to transmit the digital I/Os via DIP switch 5 (I/Os).

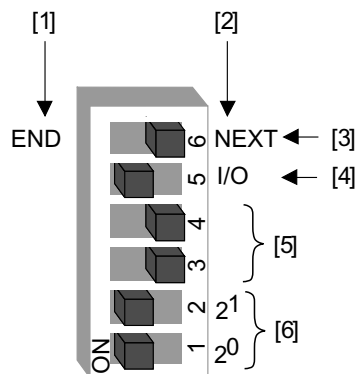
7.2.2 NEXT/END switch

The NEXT/END switch signals to the MFI whether another INTERBUS module follows. It is therefore necessary to set the switch to the "NEXT" position when a continuing remote bus is connected to terminals 6 to 10. This switch must be set to the "END" position if the MFI is the last module on the INTERBUS.

All reserved switches must be in OFF position. Else, the INTERBUS protocol chip will not be initialized. The MFI reports the ID code "MP_Not_Ready" (ID code 78_{hex}). In this case, the INTERBUS masters signal an initialization fault.

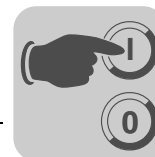
The following figure shows the SEW factory setting:

- 3 PD for MOVIMOT® + 1 word for digital I/O = 64 bit data width in INTERBUS
- Additional INTERBUS module follows (NEXT)



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- [1] MFI is the last INTERBUS module, no outgoing bus cable connected
- [2] Additional INTERBUS module follows, outgoing bus cable connected
- [3] INTERBUS termination
- [4] ON = process data length + 1 for digital I/Os
- [5] Reserved, position = OFF
- [6] Process data length for MOVIMOT® inverters



7.2.3 Settings variants of the INTERBUS data width

The following table shows the setting variants of the INTERBUS data width with DIP switches 1, 2 and 5

DIP 1: 2 ⁰	DIP 2: 2 ¹	DIP 5: +1 I/O	Designation	Function	INTERBUS data width
OFF	OFF	OFF	Reserved	none	IB Init error
ON	OFF	OFF	Reserved	Not possible with MOVIMOT®	IB Init error
OFF	ON	OFF	2 PD	2 PD to MOVIMOT®	32 bit
ON	ON	OFF	3 PD	3 PD to MOVIMOT®	48 bit
OFF	OFF	ON	0 PD + DI/DO	I/O only	16 bit
ON	OFF	ON	Reserved	Not possible with MOVIMOT®	IB Init error
OFF	ON	ON	2 PD + DI/DO	2 PD to MOVIMOT® + I/O	48 bit
ON	ON	ON	3 PD + DI/DO	3 PD to MOVIMOT® + I/O	64 bit



7.3 Configuring (projecting) the INTERBUS master

There are 2 steps involved in configuring the MFI in the INTERBUS master interface module using the project planning software CMD tool (Configuration-Monitoring-Diagnostics). The bus structure is created in the first step. Next, the process data must be described and addressed.

7.3.1 Configuring the bus structure

The bus structure can be configured online or offline using the "IBS CMD" CMD tool. In offline status, the MFI is configured using "Insert with ID code". The following information must be entered:

7.3.2 Offline configuration: Insert with ID Code

	Program setting:	Function/Meaning
Ident-Code:	3 decimal	Digital module with input/output data
Process data channel:	This setting depends on DIP switches 1, 2 and 5 on the MFI	
	32 bit	2 PD
	48 bit	3 PD or 2 PD + I/O
	64 Bit (delivery condition)	3 PD + I/O
Type of station:	Remote bus station	

7.3.3 Online configuration: Reading the configuration frame

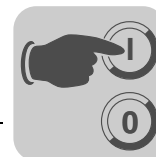
The INTERBUS system can also be fully installed first, with all MFI interface modules wired up, and then the DIP switches can be set. Next, the CMD tool can be used to load the entire bus structure (configuration frame). All MFIs are detected automatically with their data width settings.



TIPS

For process data channel lengths of 48 bit, check the setting of MFI DIP switches 1, 2 and 5 as this process data length is used both for the 3 PD and the 2 PD + DI/DO configuration.

The MFI appears as a digital I/O module (type DIO) after the loading procedure is complete.



7.4 Creating the process data description

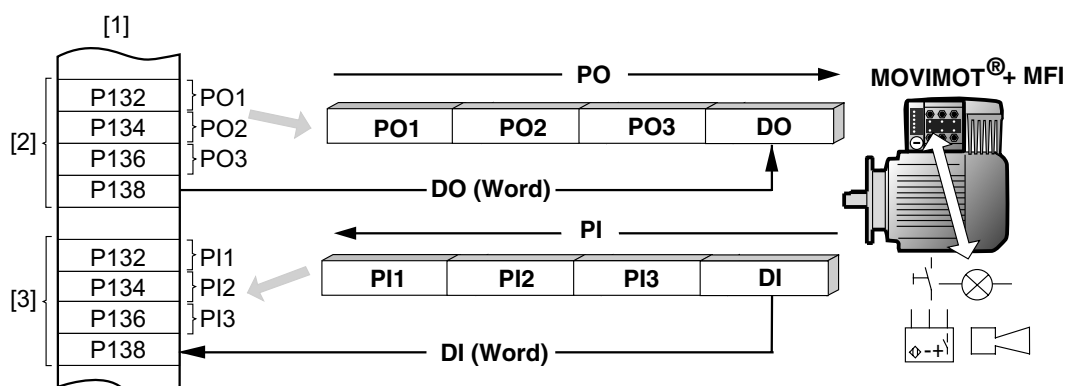
The CMD tool usually provides a default description for all MFI process data. You can use a start address for the input and output area of the control. In this variant, the addresses of the digital inputs and outputs are located directly after the MOVIMOT® process data addresses and could be in the (analog) peripheral range of the control. In this case, the reserved bits of the I/O word take up unnecessary memory in the control. A corresponding process data description makes it possible to mask out the reserved bits and assign each process data word its own address.

7.4.1 Example 1: Default process data description

The following table shows the simplest version of the process data description. The 4 process data words of the MFI indicate that the process data configuration in question is that for 3 PD+DI/DO. The start address P132 will now be assigned separately for the input and output area. All process data words are now lined up without any spaces between them.

Station name	ID	ST-No	Process data name	I/O	Length	Byte	Bit	Assignment
MOVIMOT® + MFI	3	1.0	MFI 21 IN	I	64	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI21 OUT	O	64	0	0	P132

The following figure shows the representation of the process data in the address area of the INTERBUS master module.



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[1] INTERBUS master address	PO Process output data	PI Process input data
[2] range	PO1 Control word	PI1 status word 1
[3] Output addresses	PO2 Speed [%]	PI2 Output current
Input addresses	PO3 Ramp	PI3 status word 2
	DO Digital outputs	DI Digital inputs

You can now access the process data in the control as follows:

Writing to PO1..3:	T PW 132, T PW 134, T PW 136
Reading of PI1..3:	L PW 132, L PW 134, L PW 136
Setting the outputs:	T PW 138
Reading the inputs:	L PW 138

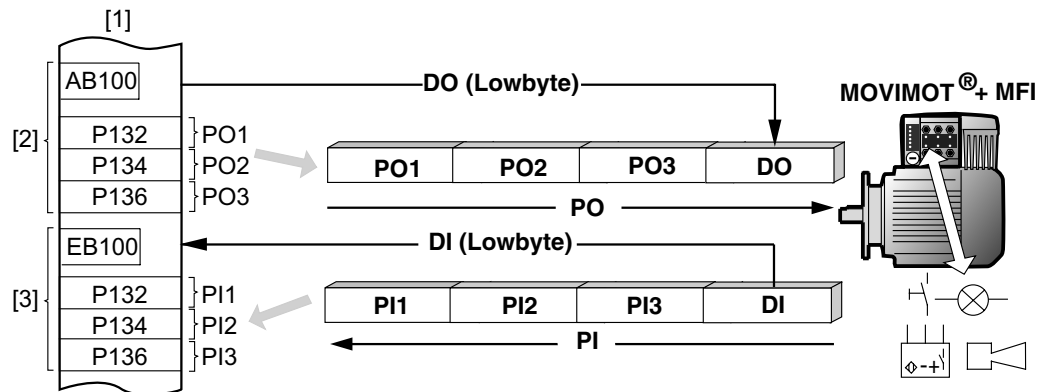


7.4.2 Example 2: Separation and optimization of process data for MOVIMOT® and DI/DO

It is much more efficient to separate the MOVIMOT® process data and the I/O data of the digital inputs and outputs that should be located in the bit-addressable area of the controller. The following table shows how the separation is made.

Station name	ID	ST-No	Process data name	I/O	Length	Byte	Bit	Assignment
MOVIMOT® + MFI	3	1.0	MFI 21 IN	I	64	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PE1..3	I	48	0	0	
MOVIMOT® + MFI	3	1.0	MFI-DI	I	16	7	0	P100
MOVIMOT® + MFI	3	1.0	MFI 21 OUT	O	64	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PO1..3	O	48	0	0	
MOVIMOT® + MFI	3	1.0	MFI-DO	O	16	7	0	P100

The following figure shows the representation of the process data in the address area of the INTERBUS master module for this optimized design.

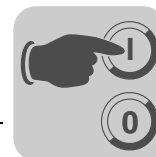


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[1] INTERBUS master address range	PO Process output data	PI Process input data
[2] Output addresses	PO1 Control word	PI1 status word 1
[3] Input addresses	PO2 Speed [%]	PI2 Output current
	PO3 Ramp	PI3 status word 2
	DO Digital outputs	DI Digital inputs

You can now access the process data in the control as follows:

Writing to PO1..3:	T PW 132, T PW 134, T PW 136
Reading of PI1..3:	L PW 132, L PW 134, L PW 136
Setting the outputs:	AB 100 (e.g. S A 100.0)
Reading the inputs:	EB 100 (e.g. U E 100.0)



7.4.3 Example 3: Detailed process data description of the MFI

This example uses the same separation of process data for MOVIMOT® and DI/DO as example 2. Each process data word is, however, described individually. This setup significantly increases the clarity. The process data can be accessed in the same way as in example 2.

Station name	ID	ST-No	Process data name	I/O	Length	Byte	Bit	Assignment
MOVIMOT® + MFI	3	1.0	MFI 21 IN	I	64	0	0	
MOVIMOT® + MFI	3	1.0	MFI-PI1	I	16	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PI2	I	16	2	0	P134
MOVIMOT® + MFI	3	1.0	MFI-PI3	I	16	4	0	P136
MOVIMOT® + MFI	3	1.0	MFI-DI	I	16	7	0	P100
MOVIMOT® + MFI	3	1.0	MFI 21 OUT	O	64	0	0	
MOVIMOT® + MFI	3	1.0	MFI-PO1	O	16	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PO2	O	16	2	0	P134
MOVIMOT® + MFI	3	1.0	MFI-PO3	O	16	4	0	P136
MOVIMOT® + MFI	3	1.0	MFI-DO	O	16	7	0	P100

7.4.4 Program in control

Refer to chapter "Sample program in connection with Simatic S7 and fieldbus (see page 159)" for a sample program to control MOVIMOT® via INTERBUS. This example has been adjusted to the configuration mentioned above.



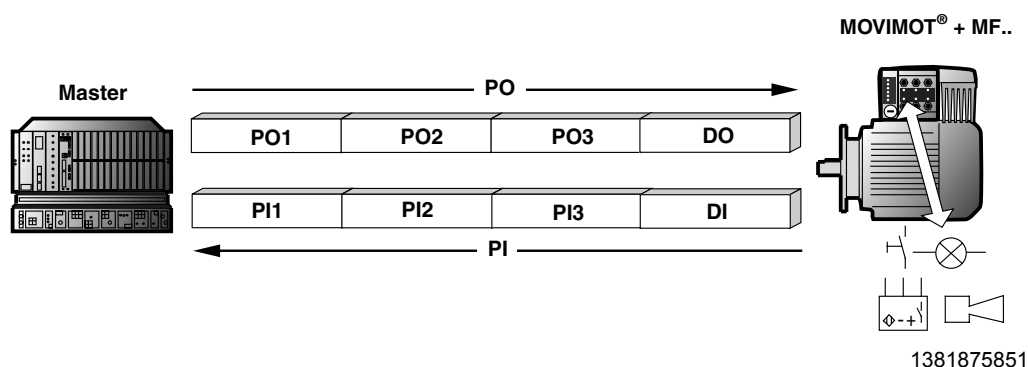
8 Function of the MFI INTERBUS Interface (Copper Line)

8.1 Process data and sensor/actuator processing

MFI INTERBUS interfaces not only make it possible to control MOVIMOT® AC motors but also permit connection of sensors/actuators to 4 digital input terminals and 2 digital output terminals. An additional I/O word is added to the INTERBUS protocol following the process data for MOVIMOT®. The extra digital inputs and outputs of the MFI are mapped in this I/O word.

The coding of the process data takes place according to the uniform MOVILINK® profile for SEW drive inverters (section "MOVILINK® unit profile" (see page 155).

8.1.1 Maximum INTERBUS configuration "3 PD + DI/DO":

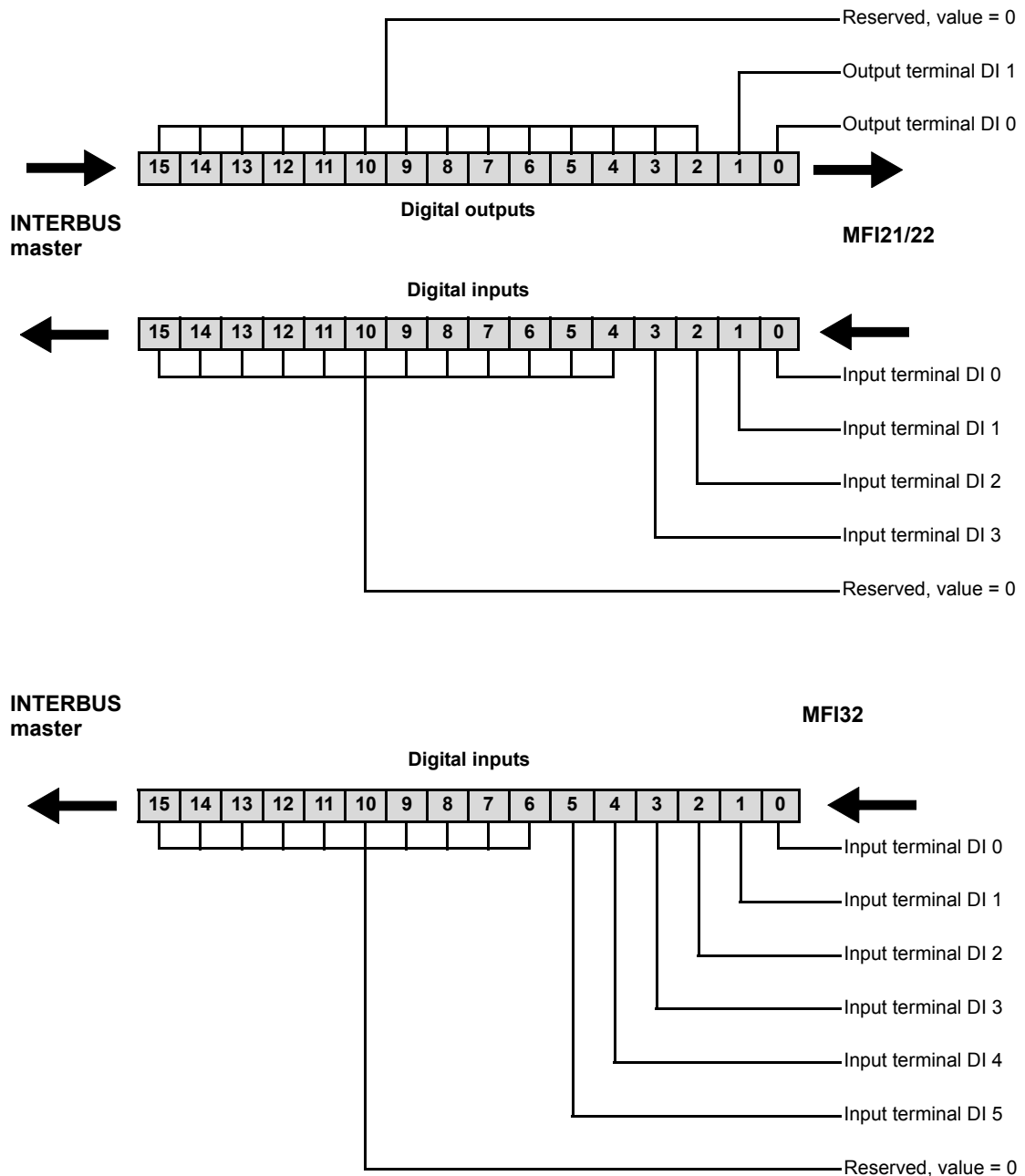


PO	Process output data	PI	Process input data
PO1	Control word	PI1	status word 1
PO2	Speed [%]	PI2	Output current
PO3	Ramp	PI3	status word 2
DO	Digital outputs	DI	Digital inputs



8.2 Structure of the MFI input/output word

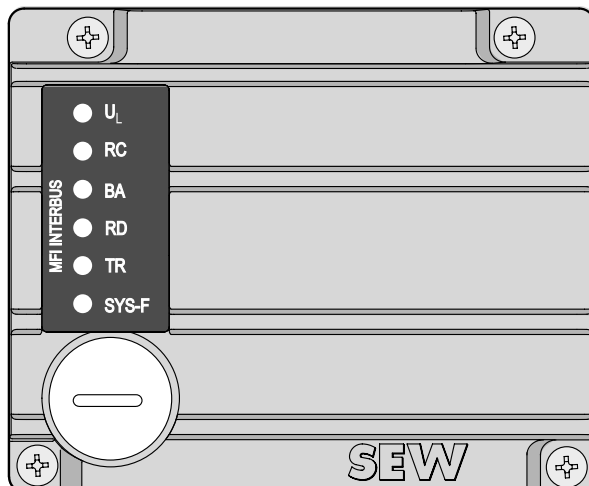
The following illustration shows the terminal information on the individual bits of the input and output word. All reserved bits can be masked out by the process data description in the INTERBUS CMD tool so that the memory area of the controller is not restricted unnecessarily.





8.3 Meaning of the LED display

The MFI INTERBUS interface has 5 LEDs for INTERBUS diagnostics and a further LED for displaying system faults.



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8.3.1 LED UL "U Logic" (green)

Status	Meaning	Remedy
On	Supply voltage is present	-
Off	Supply voltage is missing	Check the DC 24 V voltage supply and wiring of the MFI

8.3.2 LED RC "Remote Bus Check" (green)

Status	Meaning	Remedy
On	Incoming remote bus connection is functioning properly	-
Off	Incoming remote bus connection is malfunctioning	Check the incoming remote bus cable

8.3.3 LED BA "Bus Active" (green)

Status	Meaning	Remedy
On	Data transfer on INTERBUS is active	-
Off	No data transfer; INTERBUS stopped	- Check the incoming remote bus cable - Use the diagnostic display on the master interface module to localize the fault further
Flashing	Bus active, no cyclical data transmission	-



8.3.4 LED RD "Remote Bus Disable" (red)

Status	Meaning	Remedy
On	Outgoing remote bus is switched off (only in case of an error).	-
Off	Outgoing remote bus not switched off	-

8.3.5 LED TR "Transmit" (green)

Status	Meaning	Remedy
On	Parameter data exchange via PCP	-
Off	No parameter data exchange via PCP	-

8.3.6 LED SYS-F "System fault" (red)

Status	Meaning	Remedy
Off	Standard operating status of MFI and MOVIMOT®	-
Flashes 1x	MFI operating status OK, MOVIMOT® reports fault	- Evaluate the error number of MOVIMOT® status word 1 in the controller. - Read the MOVIMOT® operating instructions for information about fault rectification - Reset MOVIMOT® with programmable controller if required (reset bit in control word 1)
Flashes 2x	MOVIMOT® does not respond to setpoints from INTERBUS master because PO data are not enabled	- Check DIP switches S1/1 to S1/4 in MOVIMOT® - Set RS-485 address 1 to enable the PO data.
On	Communication link between MFI and MOVIMOT® is disrupted or interrupted	- Check the electrical connection between MFI and MOVIMOT® (terminals RS+ and RS-) - Section "Electrical Installation" (see page 36) and section "Installation planning under EMC aspects" (see page 36)
	Maintenance switch on the field distributor is set to OFF	Check setting of maintenance switch on field distributor

The LED "SYS-F" is generally deactivated in the PD configurations 0 PD + DIDO and 0 PD + DI because only the I/O module function of the MFI is activated in this operating mode.



8.4 MFI system fault/MOVIMOT® fault

The communications link between MFI and the MOVIMOT® inverter is interrupted if the MFI interface signals a system fault ("SYS-F" LED steady light). This system error is reported to the PLC as error code 91_{dec} by way of the status words of the process input data. **Since this system fault generally calls attention to cabling problems or a missing 24 V supply of the MOVIMOT® inverter, a RESET via control word is not possible! As soon as the communication link is reestablished, the error automatically resets itself.** Check the electrical connection of MFI and MOVIMOT®. In the event of a system fault, the process input data returns a fixed bit pattern as valid MOVIMOT® status information is no longer available. Consequently, only status word bit 5 (malfunction) and the fault code can be used for evaluation in the controller. All other information is invalid!

Process input word	Hex value	Meaning
PI1: Status word 1	5B20 _{hex}	Fault code 91, Bit 5 (problem) = 1 All other status information is invalid!
PI2: Current actual value	0000 _{hex}	Invalid information.
PI3: Status word 2	0020 _{hex}	Bit 5 (malfunction) = 1 All other status information is invalid.
Input byte of digital inputs	XX _{hex}	The input information of the digital inputs continues to be updated.

The input information of the digital inputs continues to be updated, and can, therefore, continue to be evaluated within the controller.

8.4.1 INTERBUS timeout

If the master interrupts the data transmission via INTERBUS, the fieldbus timeout period will start running on the MFI interface (default value 630 ms). If the transmission is physically interrupted, the interval is approximately 25 ms. The bus active LED "BA" lights up to signal that no INTERBUS data are being transmitted. MOVIMOT® decelerates immediately with the most recently valid ramp, the "Ready" relay drops out after about 1 second to signal a malfunction.

The digital outputs will be reset immediately after the fieldbus timeout interval has elapsed.

8.4.2 INTERBUS master active/control failure

The INTERBUS master sets all process output data to 0 if the PLC is switched from RUN to STOP status. MOVIMOT® then receives the ramp setpoint = 0 in 3 PD mode.

The digital outputs DO 0 and DO 1 are also reset by the INTERBUS master.



8.5 Diagnostics via INTERBUS master interface module (G4)

All generation 4 (G4) INTERBUS master interface modules offer extensive diagnostic options, both by way of the status and diagnostic display and within the controller. All major G4 diagnostic options are supported because the MFI interface is based on the INTERBUS protocol chip SUPI 3. Refer to the documentation for the master module for more information about diagnostics. The following table provides more detailed troubleshooting information about the most important fault codes in conjunction with the MFI.

8.5.1 Diagnostics reports via status and diagnostics displays of the G4 master modules

Error name	Error code (hex)	Description	Remedy
OUT1	0C8A	Error in the outgoing MFI interface. Outgoing interface (OUT1) was activated even though no station is connected or was configured in the master.	Check the setting of DIP switch 6 (NEXT/END). If the MFI is the last station, this switch must be set to END.
DEV	0C40	Fault in a station (device). The length code of the indicated MFI does not correspond with the entry in the configuration frame.	Check the DIP switch setting on the MFI.
DEV	0C70	Data transfer was cancelled, either because the initialization of SUPI 3 failed or the MFI is defective. This fault code will also be displayed when selecting a reserved DIP switch setting!	Check the DIP switch setting on the MFI for validity.
PF TEN	0BB4	Fault history of the last ten periphery faults (PF). The MFI signals a periphery fault when a microprocessor reset has been carried out (due to EMC problems or defective hardware).	Check the wiring and shielding of the MFI. Switch on the MFI. Install a new MFI electronic unit or contact SEW if the fault reoccurs.

Additional diagnostic messages are available in the description of your INTERBUS master module.



8.6 Process data monitoring

When the INTERBUS is in RUN mode, you can analyze the process data exchange between the master module and the MFI using the status and diagnostic display of the master module in monitor mode ("MONI"). This is a simple mechanism to analyze which setpoints and actual values are to be exchanged between master and MFI. The following example demonstrates the use of this monitoring function.

8.6.1 Example for process data monitoring

The MFI is operated with the "3 PD + DI/DO" configuration. The addresses were assigned as follows in the process data description:

Process output data from INTERBUS master to MFI (OUT):

MFI-PO 1..3: Address P132...136
MFI-DO Address P100

Process input data from MFI to INTERBUS master (IN):

MFI-PI 1..3: Address P132...136
MFI-DI: Address P100

You can now analyze the MFI process data as follows using the MONI operating mode:

Meaning	Process Data Name	Setting of the diagnostics display: MONI (Monitor) operating mode	
		Direction	Assignment
Control word 1 for MOVIMOT®	MFI-PO1	OUT	P132
Speed setpoint [%] for MOVIMOT®	MFI-PO2	OUT	P134
Ramp [ms] for MOVIMOT®	MFI-PO3	OUT	P136
Status of MFI binary outputs	MFI-DO	OUT	P100
Status word 1 for MOVIMOT®	MFI-PI1	IN	P132
Apparent current actual value of MOVIMOT®	MFI-PI2	IN	P134
Status word 2 for MOVIMOT®	MFI-PI3	IN	P136
Status of MFI binary inputs	MFI-DI	IN	P100



9 Startup with MFI.. INTERBUS Interface (Fibre Optic Cable)

9.1 Startup procedure

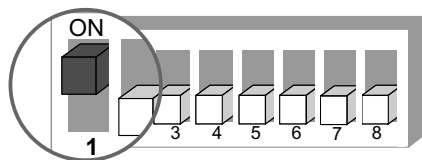
	TIP This chapter describes the startup procedure for MOVIMOT® MM..D and C in Easy mode. For information on the startup of MOVIMOT® MM..D in Expert mode, refer to the "MOVIMOT® MM..D with DRS/DRE/DRP Series AC Motors" operating instructions.
	 DANGER Before removing/fitting the MOVIMOT® inverter, you must disconnect it from the supply system. Dangerous voltages may still be present for up to one minute after disconnection from the power supply. Severe or fatal injuries from electric shock. • Disconnect the MOVIMOT® inverter from the power supply and prevent it from unintentional re-connection. • Then wait for at least 1 minute.
	 WARNING The surfaces of MOVIMOT® inverters and external options, e.g. braking resistors (especially the heat sinks), can become very hot during operation. Danger of burns. • Do not touch the MOVIMOT® drive and external options until they have cooled down sufficiently.
	TIPS • Switch off the DC 24 V supply before removing/mounting the housing cover (MFI). • In addition, observe the notes in chapter "Field distributors – supplementary startup information (see page 138)".
	TIPS • Remove paint protection cap from the status LED before startup. • Remove paint protection film from the nameplates before startup. • Check that all protective covers are installed correctly. • Observe a minimum switch-off time of 2 seconds for the mains contactor K11.



Startup with MFI.. INTERBUS Interface (Fibre Optic Cable)

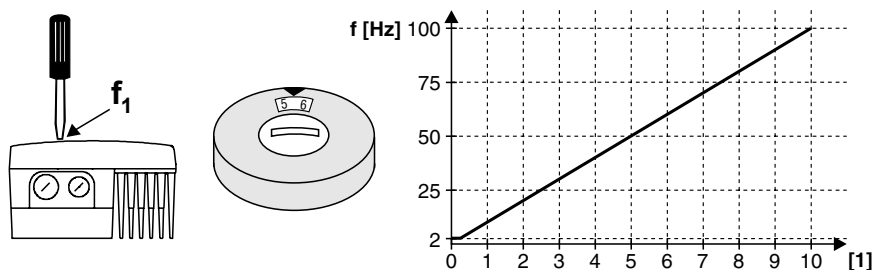
Startup procedure

1. Verify correct connection of the MOVIMOT® and INTERBUS connection module (MFZ11, MFZ13, MFZ16, MFZ17 or MFZ18).
2. Set DIP switch S1/1 of the MOVIMOT® inverter (see corresponding MOVIMOT® operating instructions) to "ON" (= address 1).



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3. Unscrew the screw plug above the setpoint potentiometer f1 on the MOVIMOT® inverter.
4. Set the maximum speed using setpoint potentiometer f1.



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[1] Potentiometer setting

5. Make sure the screw plug of the setpoint potentiometer has a seal and screw it in.



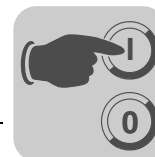
TIP

- The enclosure specified in section Technical Data only applies if the screw plugs of the setpoint potentiometer and the X50 diagnostic interface are installed correctly.
- A missing or incorrectly installed screw plug can cause damage to the MOVIMOT® inverter.



6. Set minimum frequency $f_{\min}$ with switch f2.

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Minimum frequency $f_{\min}$ [Hz]	2	5	7	10	12	15	20	25	30	35	40



7. If the ramp time is not specified via fieldbus (2 PD), set the ramp time at switch t1 of the MOVIMOT® inverter. The ramp times are based on a setpoint step change of 50 Hz.

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Ramp time t1 [s]	0.1	0.2	0.3	0.5	0.7	1	2	3	5	7	10

8. Check to see if requested direction of rotation has been enabled on MOVIMOT®.

Terminal R	Terminal L	Meaning
Activated	Activated	Both directions of rotation are enabled
Activated	Not activated	- Only CW operation enabled - Pre-selected setpoints for CCW rotation result in standstill of drive
Not activated	Activated	- Only CCW operation enabled - Pre-selected setpoints for CW rotation result in standstill of drive
Not activated	Not activated	Unit is blocked or drive brought to a stop

9. Set the MFI DIP switch as described in chapter "DIP switch setting (see page 100)".
10. Put the MOVIMOT® inverter and the MFI housing cover into place and screw them together.
11. Switch on the DC 24 V supply voltage for the MFI INTERBUS interface and the MOVIMOT® inverter. The "UL" and "RD" LEDs of the MFI should now light up and the red "SYS-F" LED should go out. If this is not the case, use the LED states to locate any wiring or setting errors. The LED statuses are described in chapter "Meaning of the LED display (see page 107)".
12. Project the MFI INTERBUS interface in the INTERBUS master according to chapter "Configuring (projecting) the INTERBUS master (see page 101)".



9.2 DIP switch settings

The MOVIMOT® process data width and MFI operating mode can be set with MFI DIP switches 1 to 8.

9.2.1 Process data length, operating mode

The process data length for MOVIMOT® is set via DIP switches 1 and 2. The MFI INTERBUS interface for MOVIMOT® supports the process data length 2 PD and 3 PD. You can select an additional word to transmit the digital I/Os via DIP switch 7 (I/Os).

9.2.2 Baud rate

The baud rate is set via DIP switch 8

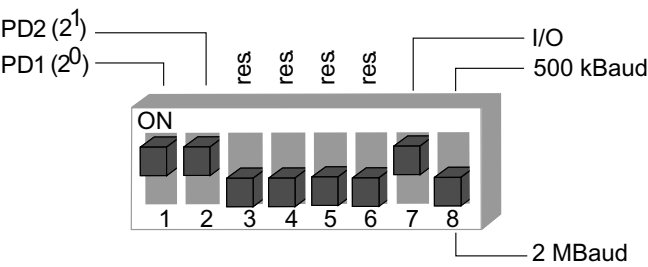
	TIP
	Make sure that all bus stations are set to the same baud rate.

9.2.3 Continuation of the ring circuit NEXT/END

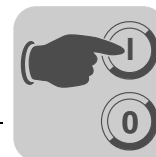
The MFI module with fibre optic cables automatically detects the last INTERBUS node. Physical continuation of the ring circuit is not possible.

The following figure shows the SEW factory setting:

- 3 PD for MOVIMOT® + 1 word for digital I/O = 64 bit data width in INTERBUS
- Baud rate = 2 MBaud



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9.2.4 Settings variants of the INTERBUS data width

The following table shows the setting variants of the INTERBUS data width with DIP switches 1, 2 and 7

DIP 1: 2 ⁰	DIP 2: 2 ¹	DIP 7: +1 I/O	Designation	Function	INTERBUS data width
OFF	OFF	OFF	Reserved	none	IB Init error
ON	OFF	OFF	Reserved	Not possible with MOVIMOT®	IB Init error
OFF	ON	OFF	2 PD	2 PD to MOVIMOT®	32 bit
ON	ON	OFF	3 PD	3 PD to MOVIMOT®	48 bit
OFF	OFF	ON	0 PD + DI/DO	I/O only	16 bit
ON	OFF	ON	Reserved	Not possible with MOVIMOT®	IB Init error
OFF	ON	ON	2 PD + DI/DO	2 PD to MOVIMOT® + I/O	48 bit
ON	ON	ON	3 PD + DI/DO	3 PD to MOVIMOT® + I/O	64 bit

9.3 Configuring (projecting) the INTERBUS master

There are 2 steps involved in configuring the MFI interface in the INTERBUS master module using the project planning software CMD tool (Configuration-Monitoring-Diagnostics). The bus structure is created in the first step. Next, the process data must be described and addressed.

9.3.1 Configuring the bus structure

The bus structure can be configured online or offline using the "IBS CMD" CMD tool. In offline status, the MFI is configured using "Insert with ID code". The following information must be entered:

9.3.2 Offline configuration: Insert with ID Code

	Program setting:	Function/Meaning
Ident-Code:	3 decimal	Digital module with input/output data
Process data channel:	This setting depends on DIP switches 1, 2 and 7 on the MFI	
	32 bit	2 PD
	48 bit	3 PD or 2 PD + I/O
	64 Bit (delivery condition)	3 PD + I/O
Type of station:	Remote bus station	

9.3.3 Online configuration: Reading the configuration frame

The INTERBUS system can also be fully installed first, with all MFI interface modules wired up, and then the DIP switches can be set. Next, the CMD tool can be used to load the entire bus structure (configuration frame). All MFIs are detected automatically with their data width settings.



TIPS

For process data channel lengths of 48 bit, check the setting of MFI DIP switches 1, 2 and 7 as this process data length is used both for the 3 PD and the 2 PD + DI/DO configuration. The MFI appears as a digital I/O module (type DIO) after the loading procedure is complete.



9.4 Creating the process data description

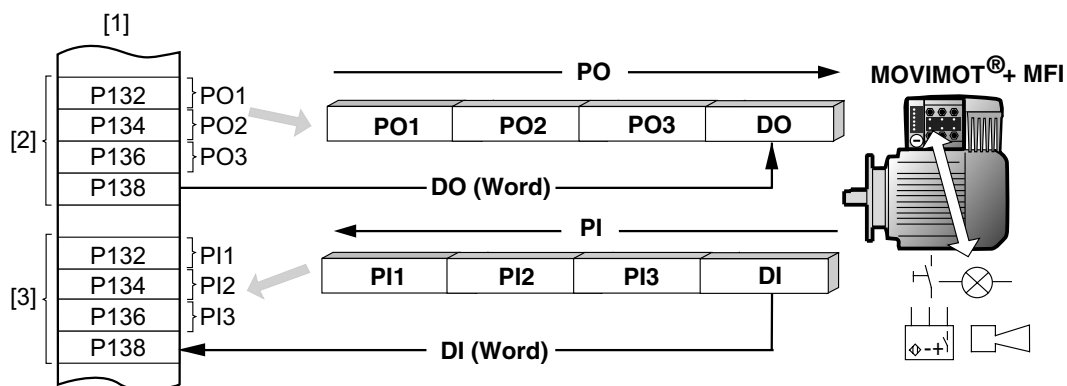
The CMD tool usually provides a default description for all MFI process data. You can use a start address for the input and output area of the control. In this variant, the addresses of the digital inputs and outputs are located directly after the MOVIMOT® process data addresses and could be in the (analog) peripheral range of the control. In this case, the reserved bits of the I/O word take up unnecessary memory in the control. A corresponding process data description makes it possible to mask out the reserved bits and assign each process data word its own address.

9.4.1 Example 1: Default process data description

The following table shows the simplest version of the process data description. The 4 process data words of the MFI indicate that the process data configuration in question is that for 3 PD+DI/DO. The start address P132 will now be assigned separately for the input and output area. All process data words are now lined up without any spaces between them.

Station name	ID	ST-No	Process data name	I/O	Length	Byte	Bit	Assignment
MOVIMOT® + MFI	3	1.0	MFI 23 IN	I	64	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI23 OUT	O	64	0	0	P132

The following figure shows the representation of the process data in the address area of the INTERBUS master module.

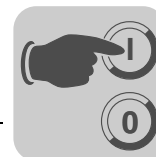


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[1] INTERBUS master address range	PO Process output data	PI Process input data
[2] Output addresses	PO1 Control word	PI1 Status word 1
[3] Input addresses	PO2 Speed [%]	PI2 Output current
	PO3 Ramp	PI3 Status word 2
	DO Digital outputs	DI Digital inputs

You can now access the process data in the control as follows:

Writing to PO1..3:	T PW 132, T PW 134, T PW 136
Reading of PI1..3:	L PW 132, L PW 134, L PW 136
Setting the outputs:	T PW 138
Reading the inputs:	L PW 138

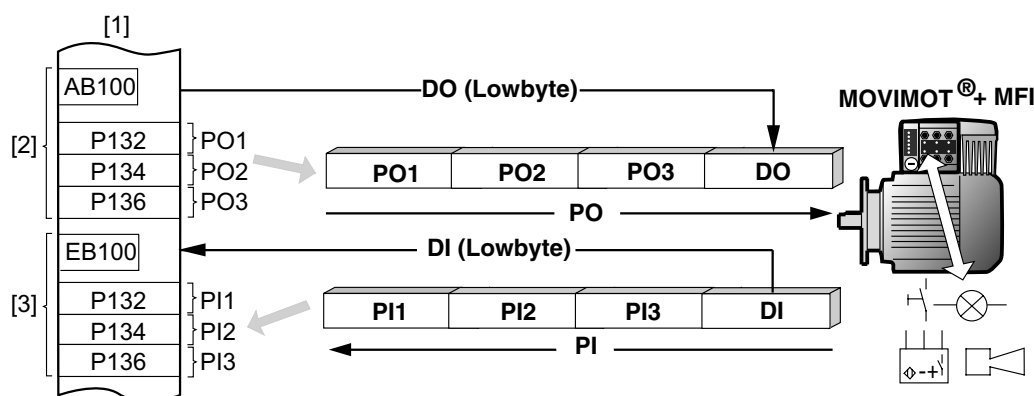


9.4.2 Example 2: Separation and optimization of process data for MOVIMOT® and DI/DO

It is much more efficient to separate the MOVIMOT® process data and the I/O data of the digital inputs and outputs that should be located in the bit-addressable area of the controller. The following table shows how the separation is made.

Station name	ID	ST-No	Process data name	I/O	Length	Byte	Bit	Assignment
MOVIMOT® + MFI	3	1.0	MFI 23 IN	I	64	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PE1..3	I	48	0	0	
MOVIMOT® + MFI	3	1.0	MFI-DI	I	16	7	0	P100
MOVIMOT® + MFI	3	1.0	MFI 23 OUT	O	64	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PO1..3	O	48	0	0	
MOVIMOT® + MFI	3	1.0	MFI-DO	O	16	7	0	P100

The following figure shows the representation of the process data in the address area of the INTERBUS master module for this optimized design.



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[1] INTERBUS master address range	PO Process output data	PI Process input data
[2] Output addresses	PO1 Control word	PI1 Status word 1
[3] Input addresses	PO2 Speed [%]	PI2 Output current
	PO3 Ramp	PI3 Status word 2
	DO Digital outputs	DI Digital inputs

You can now access the process data in the control as follows:

Writing to PO1..3:	T PW 132, T PW 134, T PW 136
Reading of PI1..3:	L PW 132, L PW 134, L PW 136
Setting the outputs:	AB 100 (e.g. S A 100.0)
Reading the inputs:	EB 100 (e.g. U E 100.0)



9.4.3 Example 3: Detailed process data description of the MFI

This example uses the same separation of process data for MOVIMOT® and DI/DO as example 2. Each process data word is, however, described individually. This setup significantly increases the clarity. The process data can be accessed in the same way as in example 2.

Station name	ID	ST-No	Process data name	I/O	Length	Byte	Bit	Assignment
MOVIMOT® + MFI	3	1.0	MFI 23 IN	I	64	0	0	
MOVIMOT® + MFI	3	1.0	MFI-PI1	I	16	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PI2	I	16	2	0	P134
MOVIMOT® + MFI	3	1.0	MFI-PI3	I	16	4	0	P136
MOVIMOT® + MFI	3	1.0	MFI-DI	I	16	7	0	P100
MOVIMOT® + MFI	3	1.0	MFI 23 OUT	O	64	0	0	
MOVIMOT® + MFI	3	1.0	MFI-PO1	O	16	0	0	P132
MOVIMOT® + MFI	3	1.0	MFI-PO2	O	16	2	0	P134
MOVIMOT® + MFI	3	1.0	MFI-PO3	O	16	4	0	P136
MOVIMOT® + MFI	3	1.0	MFI-DO	O	16	7	0	P100

9.4.4 Program in control

Refer to chapter "Sample program in connection with Simatic S7 and fieldbus (see page 159)" for a sample program, adjusted to the configuration mentioned above, to control MOVIMOT® via INTERBUS.



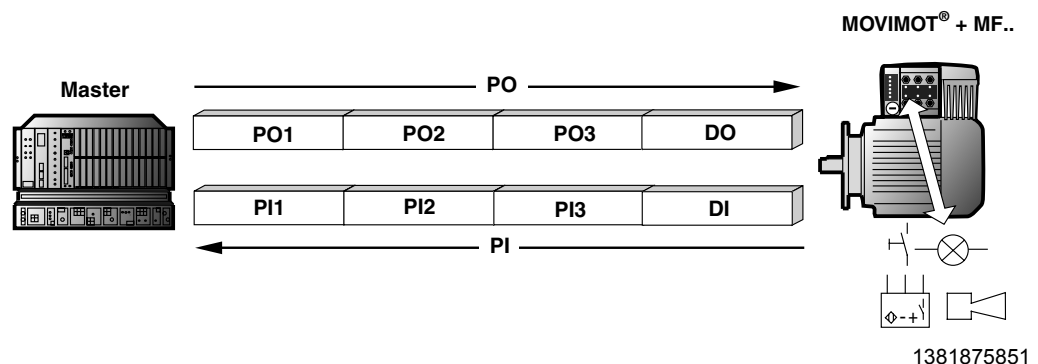
10 Function of the MFI INTERBUS Interface (Fibre Optic Cable)

10.1 Process data and sensor/actuator processing

MFI INTERBUS interfaces not only make it possible to control MOVIMOT® AC motors but also permit connection of sensors/actuators to 4 digital input terminals and 2 digital output terminals. An additional I/O word is added to the INTERBUS protocol following the process data for MOVIMOT®. The extra digital inputs and outputs of the MFI are mapped in this I/O word.

The coding of the process data takes place according to the uniform MOVILINK® profile for SEW drive inverters (section "MOVILINK® unit profile" (see page 155).

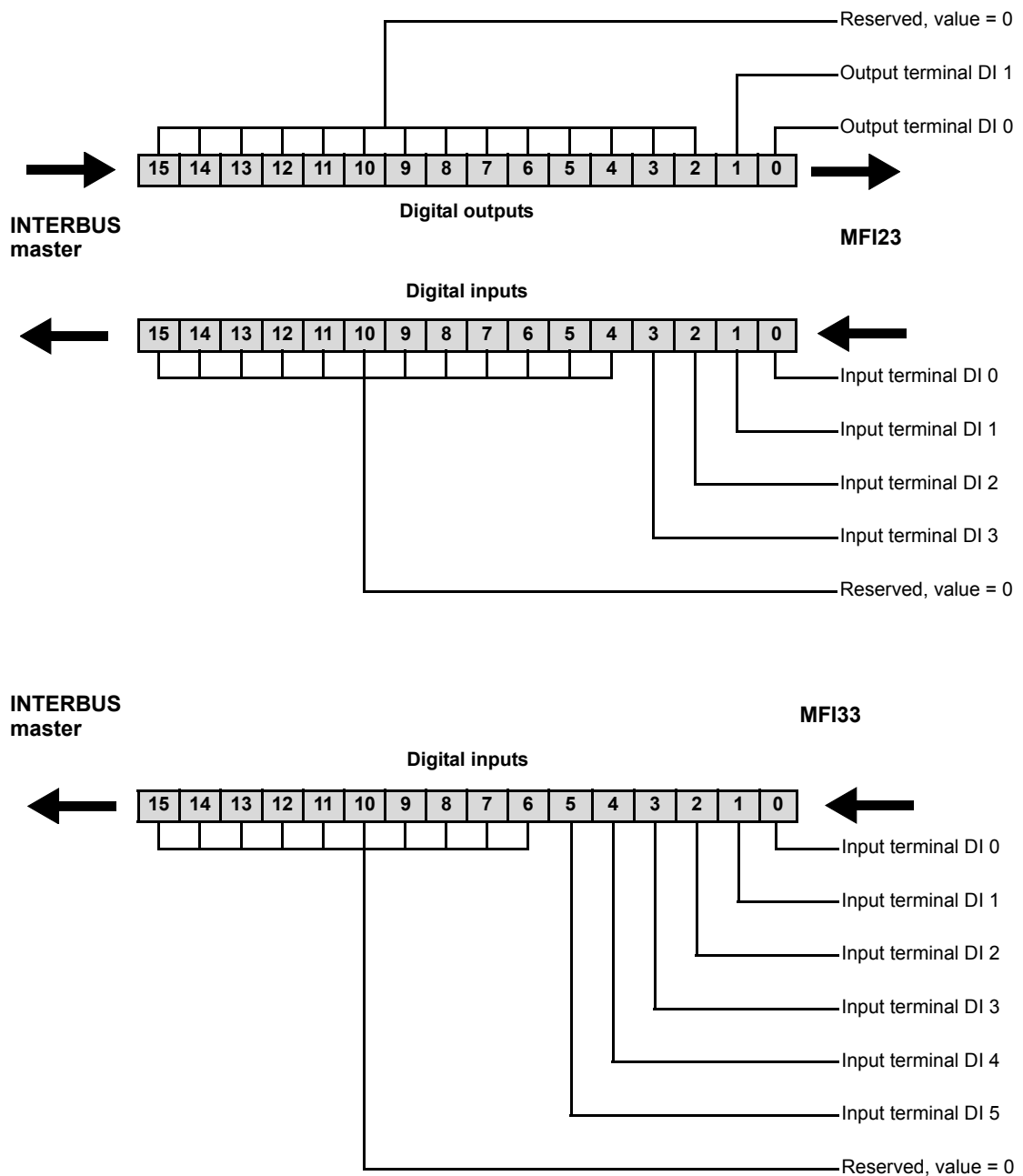
10.1.1 Maximum INTERBUS configuration "3 PD + DI/DO":



PO	Process output data	PI	Process input data
PO1	Control word	PI1	Status word 1
PO2	Speed [%]	PI2	Output current
PO3	Ramp	PI3	Status word 2
DO	Digital outputs	DI	Digital inputs



10.2 Structure of the MFI23/MFI33 input/output word





10.3 INTERBUS peripheral fault

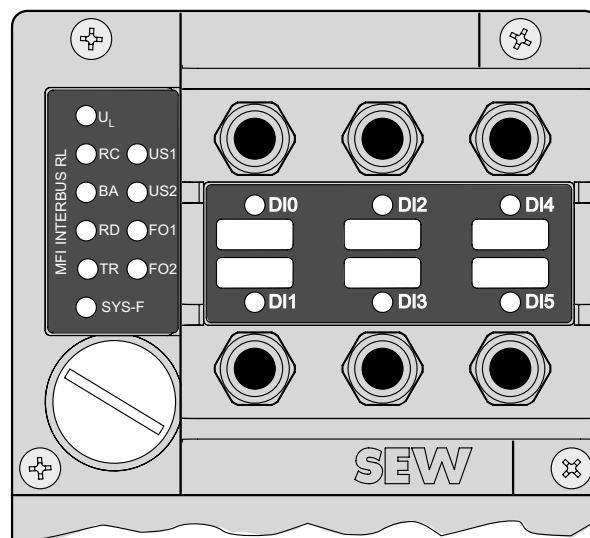
The INTERBUS interfaces can report the following errors also as peripheral faults to the INTERBUS master:

- Fault 83 "Short circuit output" and
- VS1 supply voltage too low

You can reset the faults via the CMD tool in the INTERBUS master (interface module, right-click: Operate/Other services/Accept module error).

10.4 Meaning of the LED display

The MFI INTERBUS interface has 5 LEDs for INTERBUS diagnostics and a further LED for displaying system faults.



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10.4.1 LED UL "U Logic" (green)

Status	Meaning	Remedy
On	• Supply voltage is present	-
Off	• Supply voltage is missing	• Check the DC 24 V voltage supply and wiring of the MFI interface

10.4.2 LED RC "Remote Bus Check" (green)

Status	Meaning	Remedy
On	• Incoming remote bus connection is functioning properly	-
Off	• Incoming remote bus connection is malfunctioning	• Check the incoming remote bus cable



Function of the MFI INTERBUS Interface (Fibre Optic Cable)

Meaning of the LED display

10.4.3 LED BA "Bus Active" (green)

Status	Meaning	Remedy
On	Data transfer on INTERBUS is active	-
Off	No data transfer; INTERBUS stopped	- Check the incoming remote bus cable - Use the diagnostic display on the master interface module to localize the fault further
Flashing	Bus active, no cyclical data transmission	-

10.4.4 LED RD "Remote Bus Disable" (yellow)

Status	Meaning	Remedy
On	Outgoing remote bus is switched off (only in case of an error).	-
Off	Outgoing remote bus not switched off	-

10.4.5 LED TR "Transmit" (green)

Status	Meaning	Remedy
On	Parameter data exchange via PCP	-
Off	No parameter data exchange via PCP	-

10.4.6 LED SYS-F "System fault" (red)

Status	Meaning	Remedy
Off	Standard operating status of the MFI interface and the MOVIMOT[®] inverter	-
Flashes 1x	MFI operating status OK, MOVIMOT[®] reports fault	- Evaluate the error number of MOVIMOT[®] status word 1 in the controller. - Read the MOVIMOT[®] operating instructions for information about fault rectification - If required, reset MOVIMOT[®] with the controller (reset bit in control word 1)
Flashes 2x	MOVIMOT[®] does not respond to setpoints from INTERBUS master because PO data are not enabled	- Check DIP switches S1/1 - S1/4 on the MOVIMOT[®]. - Set RS-485 address 1 to enable the PO data.
On	Communication link between MFI and MOVIMOT[®] is disrupted or interrupted	- Check the electrical connection between MFI and MOVIMOT[®] (terminals RS+ and RS-) - Section "Electrical Installation" (see page 36) and section "Installation planning under EMC aspects" (see page 36)
	Maintenance switch on the field distributor is set to OFF	Check setting of maintenance switch on field distributor



The LED "SYS-F" is generally deactivated in the PD configurations 0 PD + DDO and 0 PD + DI because only the I/O module function of the MFI is activated in this operating mode.

10.4.7 VS1 (green)

Monitoring the supply voltage V_{S1}

Status	Meaning
Off	V_{S1} not available
Flashing	V_{S1} below the permitted voltage range
On	V_{S1} available

10.4.8 VS2 (green)

Monitoring the supply voltage V_{S2}

Status	Meaning
On	V_{S2} available
Off	V_{S2} not available or below the permitted voltage range

10.4.9 FO1 (yellow)

Monitoring of incoming fiber optic cable distance

Status	Meaning
On	Incoming fiber optic cable distance not OK or system reserve reached in controlled operation
Off	Incoming fiber optic cable distance OK

10.4.10 FO2 (yellow)

Monitoring of outgoing fiber optic cable distance.

Status	Meaning
On	Outgoing fiber optic cable distance not OK or system reserve reached in controlled operation
Off	Outgoing fiber optic cable distance OK or not assigned



10.5 MFI system fault/MOVIMOT® fault

The communications link between MFI and the MOVIMOT® inverter is interrupted if the MFI interface signals a system fault ("SYS-F" LED steady light). This system error is reported to the PLC as error code 91_{dec} by way of the status words of the process input data. **Since this system fault generally calls attention to cabling problems or a missing 24 V supply of the MOVIMOT® inverter, a RESET via control word is not possible! As soon as the communication link is reestablished, the error automatically resets itself.** Check the electrical connection of MFI and MOVIMOT®. In the event of a system fault, the process input data returns a fixed bit pattern as valid MOVIMOT® status information is no longer available. Consequently, only status word bit 5 (malfunction) and the fault code can be used for evaluation in the controller. All other information is invalid!

Process input word	Hex value	Meaning
PI1: Status word 1	5B20 _{hex}	Fault code 91, Bit 5 (problem) = 1 All other status information is invalid.
PI2: Current actual value	0000 _{hex}	Invalid information.
PI3: Status word 2	0020 _{hex}	Bit 5 (malfunction) = 1 All other status information is invalid.
Input byte of the digital inputs	XX _{hex}	The input information of the digital inputs is still updated!

The input information of the digital inputs continues to be updated, and can, therefore, continue to be evaluated within the controller.

10.5.1 INTERBUS timeout

If the master interrupts the data transmission via INTERBUS, the fieldbus timeout period will start running on the MFI interface (default value 630 ms). If the transmission is physically interrupted, the interval is approximately 25 ms. The bus active LED "BA" lights up to signal that no INTERBUS data are being transmitted. MOVIMOT® decelerates immediately with the most recently valid ramp, the "Ready" relay drops out after about 1 second to signal a malfunction.

The digital outputs will be reset immediately after the fieldbus timeout interval has elapsed.

10.5.2 INTERBUS master active/control failure

The INTERBUS master sets all process output data to 0 if the PLC is switched from RUN to STOP status. MOVIMOT® then receives the ramp setpoint = 0 in 3 PD mode.

The digital outputs DO 0 and DO 1 are also reset by the INTERBUS master.



10.6 Diagnostics via INTERBUS master interface module (G4)

All generation 4 (G4) INTERBUS master interface modules offer extensive diagnostic options, both by way of the status and diagnostic display and within the controller. All major G4 diagnostic options are supported because the MFI interface is based on the INTERBUS protocol chip SUPI 3. Refer to the documentation for the master module for more information about diagnostics. The following table provides more detailed troubleshooting information about the most important fault codes in conjunction with the MFI.

10.6.1 Diagnostics reports via status and diagnostics displays of the G4 master modules

Error name	Error code (hex)	Description	Remedy
DEV	0C40	Fault in a station (device). The length code of the indicated MFI does not correspond with the entry in the configuration frame.	Check the DIP switch setting on the MFI.
DEV	0C70	Data transfer was cancelled, either because the initialization of SUPI 3 failed or the MFI is defective. This fault code will also be displayed when selecting a reserved DIP switch setting!	Check the DIP switch setting on the MFI for validity.
PF TEN	0BB4	Fault history of the last ten periphery faults (PF). The MFI signals a periphery fault when a microprocessor reset has been carried out (due to EMC problems or defective hardware) or VS2 is below the permitted voltage range.	Check the wiring and shielding of the MFI. Check the VS2. Switch on the MFI. If the problem occurs repeatedly, replace the MFI electronics or consult SEW-EURODRIVE.

Additional diagnostic messages are available in the description of your INTERBUS master module.



10.7 Process data monitoring

When the INTERBUS is in RUN mode, you can analyze the process data exchange between the master module and the MFI using the status and diagnostic display of the master module in monitor mode ("MONI"). This is a simple mechanism to analyze which setpoints and actual values are to be exchanged between master and MFI. The following example demonstrates the use of this monitoring function.

10.7.1 Example for process data monitoring

The MFI is operated with the "3 PD + DI/DO" configuration. The addresses were assigned as follows in the process data description:

Process output data from INTERBUS master to MFI (OUT):

MFI-PO 1..3: Address P132...136
MFI-DO Address P100

Process input data from MFI to INTERBUS master (IN):

MFI-PI 1..3: Address P132...136
MFI-DI: Address P100

You can now analyze the MFI process data as follows using the MONI operating mode:

Meaning	Process data name	Setting of the diagnostics display: MONI (Monitor) operating mode	
		Direction	Assignment
Control word 1 for MOVIMOT®	MFI-PO1	OUT	P132
Speed setpoint [%] for MOVIMOT®	MFI-PO2	OUT	P134
Ramp [ms] for MOVIMOT®	MFI-PO3	OUT	P136
Status of MFI binary outputs	MFI-DO	OUT	P100
Status word 1 for MOVIMOT®	MFI-PI1	IN	P132
Apparent current actual value of MOVIMOT®	MFI-PI2	IN	P134
Status word 2 for MOVIMOT®	MFI-PI3	IN	P136
Status of MFI binary inputs	MFI-DI	IN	P100



11 Startup with MQI.. INTERBUS Interface (Copper Line)

11.1 Startup procedure

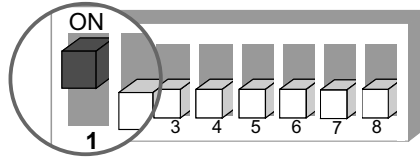
	TIP This chapter describes the startup procedure for MOVIMOT® MM..D and C in Easy mode. For information on the startup of MOVIMOT® MM..D in Expert mode, refer to the "MOVIMOT® MM..D with DRS/DRE/DRP Series AC Motors" operating instructions.
	 DANGER Before removing/fitting the MOVIMOT® inverter, you must disconnect it from the supply system. Dangerous voltages may still be present for up to one minute after disconnection from the power supply. Severe or fatal injuries from electric shock. • Disconnect the MOVIMOT® inverter from the power supply and prevent it from unintentional re-connection. • Then wait for at least 1 minute.
	 WARNING The surfaces of MOVIMOT® inverters and external options, e.g. braking resistors (especially the heat sinks), can become very hot during operation. Danger of burns. • Do not touch the MOVIMOT® drive and external options until they have cooled down sufficiently.
	TIPS • Switch off the DC 24 V supply before removing/mounting the housing cover (MQI). • Removal of the housing cover interrupts the ring structure of the INTERBUS. This means the entire bus system is no longer operational! • In addition, observe the notes in chapter "Field distributors – supplementary startup information (see page 138)".
	TIPS • Remove paint protection cap from the status LED before startup. • Remove paint protection film from the nameplates before startup. • Check that all protective covers are installed correctly. • Observe a minimum switch-off time of 2 seconds for the mains contactor K11.



Startup with MQI.. INTERBUS Interface (Copper Line)

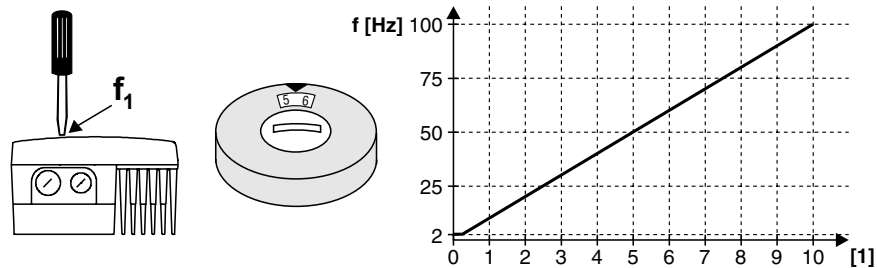
Startup procedure

1. Verify correct connection of the MOVIMOT® and INTERBUS connection module (MFZ11, MFZ13, MFZ16, MFZ17 or MFZ18).
2. Set DIP switch S1/1 of the MOVIMOT® inverter (see corresponding MOVIMOT® operating instructions) to "ON" (= address 1).



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3. Unscrew the screw plug above the setpoint potentiometer f1 on the MOVIMOT® inverter.
4. Set the maximum speed using setpoint potentiometer f1.



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[1] Potentiometer setting

5. Make sure the screw plug of the setpoint potentiometer has a seal and screw it in.



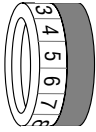
TIP

- The enclosure specified in section Technical Data only applies if the screw plugs of the setpoint potentiometer and the X50 diagnostic interface are installed correctly.
- A missing or incorrectly installed screw plug can cause damage to the MOVIMOT® inverter.



6. Set minimum frequency $f_{\min}$ with switch f2.

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Minimum frequency $f_{\min}$ [Hz]	2	5	7	10	12	15	20	25	30	35	40



7. If the ramp time is not specified via fieldbus (2 PD), set the ramp time at switch t1 of the MOVIMOT® inverter. The ramp times are based on a setpoint step change of 50 Hz.

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Ramp time t1 [s]	0.1	0.2	0.3	0.5	0.7	1	2	3	5	7	10

8. Check to see if requested direction of rotation has been enabled on MOVIMOT®.

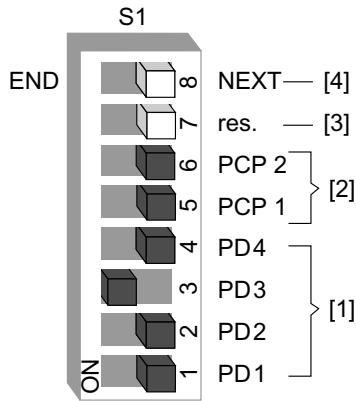
Terminal R	Terminal L	Meaning
Activated	Activated	Both directions of rotation are enabled
Activated	Not activated	- Only CW operation enabled - Pre-selected setpoints for CCW rotation result in standstill of drive
Not activated	Activated	- Only CCW operation enabled - Pre-selected setpoints for CW rotation result in standstill of drive
Not activated	Not activated	Unit is blocked or drive brought to a stop

9. Set the MQI DIP switch as described in chapter "MQI DIP switch setting (see page 116)".
10. Put the MOVIMOT® inverter and the MQI housing cover into place and screw them together.
11. Switch on the DC 24 V supply voltage for the MQI INTERBUS interface and the MOVIMOT® inverter. The "UL" and "RD" LEDs of the MQI should now light up and the red "SYS-F" LED should go out. If this is not the case, use the LED states to locate any wiring or setting errors. The LED statuses are described in chapter "Meaning of the LED display (see page 135)".
12. Project the MQI INTERBUS interface in the INTERBUS master according to chapter "Configuring (projecting) the INTERBUS master (see page 118)".



11.2 MQI DIP switch settings

The following figures shows the factory setting for the MQI DIP switch:



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- [1] Setting the process data length
- [2] Setting the PCP length
- [3] Reserved, position = OFF
- [4] NEXT/END switch

11.2.1 Process data length

DIP switches S1/1 to S1/4 are used to set the process data length up to a length of 10 words (see the following table). The process data is used to control the MOVIMOT[®] connected to the MQI. Control and status information is exchanged via the process data channel. The number of process data words used depends on your IPOS application. All data is processed by IPOS.

S1/1 2 ⁰	S1/2 2 ¹	S1/3 2 ²	S1/4 2 ³	Designation	Function	INTERBUS data width
OFF	OFF	OFF	OFF	Reserved	none	IB Init error
ON	OFF	OFF	OFF	1PD	1 PD to MQI	16 bit
OFF	ON	OFF	OFF	2PD	2 PD to MQI	32 bit
ON	ON	OFF	OFF	3PD	3 PD to MQI	48 bit
OFF	OFF	ON	OFF	4PD	4 PD to MQI	64 bit
ON	OFF	ON	OFF	5PD	5 PD to MQI	80 bit
OFF	ON	ON	OFF	6PD	6 PD to MQI	96 bit
ON	ON	ON	OFF	7PD	7 PD to MQI	112 bit
OFF	OFF	OFF	ON	8PD	8 PD to MQI	128 bit
ON	OFF	OFF	ON	9PD	9 PD to MQI	144 bit
OFF	ON	OFF	ON	10PD	10 PD to MQI	160 bit

11.2.2 Setting the PCP length

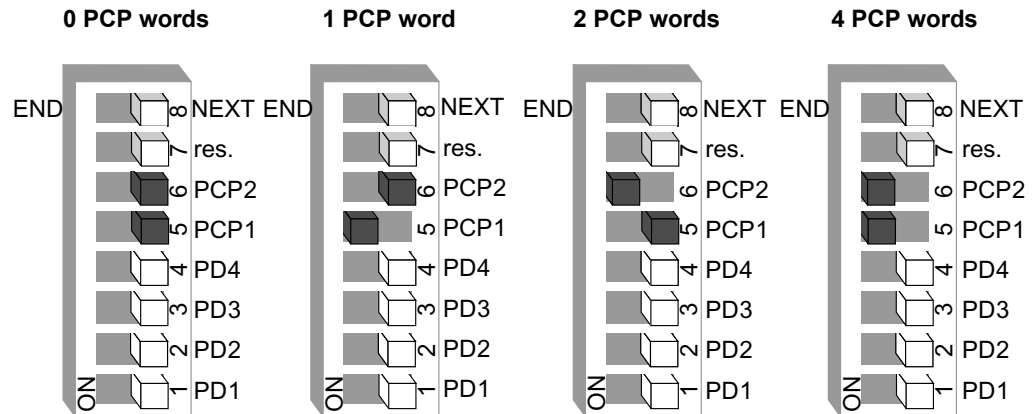
You can use switches S1/5 to S1/6 to set the PCP length. PCP is the INTERBUS parameter channel and is used to set the parameters for the MQI interface and the MOVIMOT[®] inverter.



PCP channel

The PCP channel can be set to 0 to 4 words. At least one word must be set to enable parameter data exchange. Higher settings increase the transmission speed.

The following figure shows possible settings for the PCP channel:



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The MQI supports a maximum data width of 10 words. The valid settings are shown in the following table:

Number of process data words	0 PCP words	1 PCP word	2 PCP words	4 PCP words
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

 = valid setting



TIP

- De-energize the MQI interface before you change the DIP switch settings. The settings of DIP switches S1/1 to S1/6 are only adopted during the initialization.
- If the settings of the DIP switches S1/1 to S1/6 are invalid, the MQI outputs the ID code Microprocessor not ready (38 h).

11.2.3 NEXT/END switch

Switch S1/8 indicates whether there is another INTERBUS (OFF = NEXT) or whether the MQI is the last node (ON = END).



11.3 Configuring the INTERBUS master

There are 2 steps involved in configuring the MQI INTERBUS interface in the master module using the project planning software CMD tool (Configuration-Monitoring-Diagnostics). The bus structure is created in the first step. Next, the process data must be described and addressed.

11.3.1 Configuring the bus structure

The bus structure can be configured online or offline using the "IBS CMD" CMD tool. In offline status, the MQI is configured using "Insert with ID code". The following information must be entered:

Offline configuration: Insert with ID Code

	Program settings	Function/Meaning
Ident code	3 decimal	Digital module with input/output data
Process data channel	16 bit	1 PD
	32 bit	2 PD
	48 bit	3 PD
	64 bit	4 PD
	80 bit	5 PD
	96 bit	6 PD
	112 bit	7 PD
	128 bit	8 PD
	144 bit	9 PD
	160 bit	10 PD
Ident code	227 decimal	Drivecom 1 PCP word
Process data channel	16 bit	1 PD + 1 word PCP
	32 bit	2 PD + 1 word PCP
	48 bit	3 PD + 1 word PCP
	64 bit	4 PD + 1 word PCP
	80 bit	5 PD + 1 word PCP
	96 bit	6 PD + 1 word PCP
	112 bit	7 PD + 1 word PCP
	128 bit	8 PD + 1 word PCP
	144 bit	9 PD + 1 word PCP
Ident code	224 decimal	Drivecom 2 PCP words
Process data channel	16 bit	1 PD + 2 words PCP
	32 bit	2 PD + 2 words PCP
	48 bit	3 PD + 2 words PCP
	64 bit	4 PD + 2 words PCP
	80 bit	5 PD + 2 words PCP
	96 bit	6 PD + 2 words PCP
	112 bit	7 PD + 2 words PCP
	128 bit	8 PD + 2 words PCP



	Program settings	Function/Meaning
Ident code	225 decimal	Drivecom 4 PCP words
Process data channel	16 bit	1 PD + 4 words PCP
	32 bit	2 PD + 4 words PCP
	48 bit	3 PD + 4 words PCP
	64 bit	4 PD + 4 words PCP
	80 bit	5 PD + 4 words PCP
	96 bit	6 PD + 4 words PCP
Type of station	Remote bus station	

Online configuration: Reading the configuration frame

The INTERBUS system can also be fully installed first, with all MQI interface modules wired up, and then the DIP switches can be set. Next, the CMD tool can be used to load the entire bus structure (configuration frame). All MQIs are detected automatically with their data width settings.

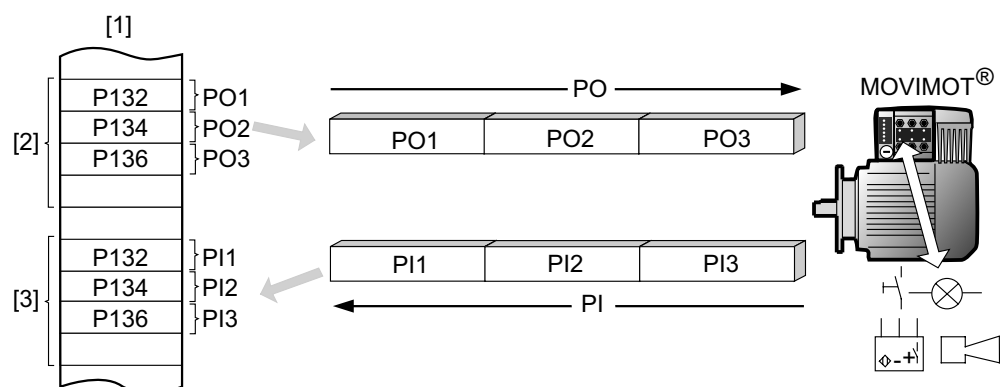
11.4 Creating the process data description

The CMD tool always provides a default description for all MQI process data. You can use a start address for the input and output area of the control.

The following table shows the simplest version of the process data description for three process data words without PCP:

Name of the node	ID	ST-No	Process data name	I/O	Length	Byte	Bit	Assignment
MOVIMOT® +MQI	3	1.0	MQI IN	E	48	0	0	P132
MOVIMOT® +MQI	3	1.0	MQI OUT	A	48	0	0	P132

The following figure shows the representation of the process data in the address area of the INTERBUS master module.



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- PI** Process input data
PO Process output data
 [1] INTERBUS master address range
 [2] Output addresses
 [3] Input addresses



12 Function of the MQI INTERBUS Interfaces (Copper Line)

Intelligent MQI INTERBUS modules (as well as the MFI modules) make for a convenient fieldbus connection of MOVIMOT® drives.

In addition, they are equipped with control functions that help you determine the response of the drive to external input via fieldbus and integrated I/Os. For example, you can process sensor signals directly in the fieldbus interface or define your own communication profile via the fieldbus interface. Using a NV26, ES16 or EI76 sensor makes for a simple positioning system that can be integrated in your application in combination with an MQD control program.

The control functionality of the MQI modules is enabled with IPOS^{plus}®. The diagnostics and programming interface (under the screw plug on the front) of the modules provides access to the integrated IPOS control. Option UWS21B or USB11A is used for connection to a PC. The MOVITOOLS® Compiler is used for programming.



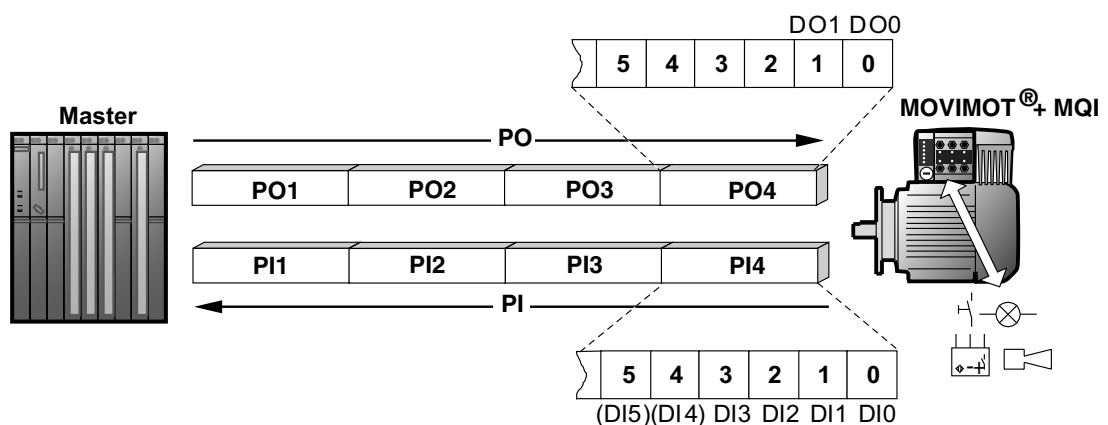
TIP

For more information on programming, refer to the IPOS^{plus}® Positioning and Sequence Control" manual.

12.1 Default program

The MQI modules are supplied as standard with an IPOS program, which simulates the functionality of the MFI modules.

Set address 1 on the MOVIMOT® drive and observe the instructions for startup. The process data length is fixed at 4 words (consider for project planning/startup). The first 3 words are exchanged transparently with MOVIMOT® and correspond to the MOVILINK® unit profile. Compare: chapter "MOVILINK® unit profile (see page 155)". The I/Os of the MQI modules are transmitted in the fourth word.



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12.1.1 Error responses

An interruption of the connection between MQI module and MOVIMOT[®] results in a shutdown after 1 s. The error is displayed via status word 1 (error 91). **Since this system fault generally calls attention to cabling problems or a missing 24 V supply of the MOVIMOT[®] inverter, a RESET via control word is not possible! As soon as the communication link is reestablished, the error automatically resets itself.** An interruption of the connection between fieldbus master and MQI module after expiration of the fieldbus timeout interval, sets the process output data for MOVIMOT[®] to 0. This fault response can be deactivated using parameter 831 in MOVITOOLS[®] Shell.

12.2 Control via INTERBUS

Data is exchanged between the INTERBUS master and MQI using the peripheral area. The process data is stored as blocks in this range, e.g. POW 306 - POW 308 for the process output data or PIW 306 - PIW 308 for the process input data.

12.3 PCP interface

The MQI fieldbus interfaces offer a standardized interface for setting parameters using the "Peripherals Communication Protocol" (PCP). This communication channel gives you full access to the parameters of the MQI and the drive parameters of the MOVIMOT[®] connected to the MQI.

12.3.1 Basic overview

The PCP channel of the MQI must be set to 1, 2 or 4 words (section "MQI DIP switch settings" (see page 116)) to access the MQI or MOVIMOT[®] parameter values. The speed of access to parameter values via the PCP channel is controlled with the number of PCP words. The PCP interface for MQI is implemented with PCP version 3.0.

12.3.2 PCP services

The following PCP services are used for parameter setting:

- Establishing the connection (Initiate)
- Reading parameter values (READ)
- Writing parameter values (WRITE)
- Terminating the connection (ABORT)

Refer to the user manual for your INTERBUS interface module for a detailed description of the PCP services.



Establishing the communication link with "Initiate"

The Initiate PCP service establishes a communication link for parameter setting between an INTERBUS interface module and the MQI. Communication is always established by the INTERBUS interface module.

As the connection is being established, various conventions regarding the communication link are checked, such as supported PCP services, user data length, etc. If the connection is established successfully, the MQI will answer with a positive Initiate Response. If connection could not be established, then the arrangements for the communication link between the INTERBUS interface module and MQI do not match. MQI answers with "Initiate Error Response".

In this case, compare the configured list Communication relations of the INTERBUS interface module with the list for MQI. Any attempt to re-establish an already existing communication link generally results in an abort. The communication link is then dropped, which means the "Initiate" PCP service has to be run for a third time to re-establish the communication connection.

Terminating the communication link with ABORT

The ABORT PCP service terminates an existing communication link between the INTERBUS interface module and MQI. ABORT is an unconfirmed PCP service that can be triggered either from the INTERBUS interface module or from MQI.

Reading parameter values with READ

The READ PCP service is used to grant the INTERBUS interface module read access to all communication objects (parameters) of the MQI or to a connected drive inverter. A detailed list of all MQI parameters as well as their coding is available in chapter "Parameters (see page 161)".

Writing parameter values with WRITE

The WRITE PCP service is used to grant the INTERBUS interface module write access to all parameters of the MQI or to a connected drive inverter. If a parameter is accessed incorrectly (e.g. written value is too high), the MQI generates a "WRITE ERROR RESPONSE" with exact information on the cause of the error.



12.3.3 Parameters in the object list

The READ and WRITE PCP services give the INTERBUS interface module access to all parameters defined in the object list of the MQI. All parameters of the fieldbus interface accessible via the bus system are defined as communications objects in the MQI object list. All objects in the static object list are addressed using indices. The following tables show the structure of the object list for MQI.

The index range is divided into 3 logical sections. The MQI parameters are addressed using indices 8300_{dec} to 8313_{dec}. For a detailed overview of the parameters, refer to chapter "Parameters (see page 161)". Indices below 8300_{dec} can be used to reach parameters included in the object lists or to address parameters from one of the MOVIMOT[®] units connected to the MQI.

Parameter index (decimal)	Designation of the communications object
8288	Variable data channel with acyclic routing (MQI and parameters of the connected drive inverters can be reached)
8296	Download parameter block
8297	Last PCP index
8299	Acyclic MOVILINK [®] parameter channel (only MQI parameters can be reached)
8300-8313	MQI parameters
8314-9999	MQI parameters or parameters from one of the MOVIMOT [®] units connected to the MQI that can be addressed via object 8288.
> 10000	Table, program and variable memory of MQI or one of the MOVIMOT [®] units connected to the MQI. These parameters can be addressed with object 8288.

Object description of MQI or drive parameter

The parameters of the connected MOVIMOT[®] units are described in section "Parameters (see page 161)". Apart from the parameter index, this gives you additional information on coding, the range of values and the meaning of the parameter data. The object description in the object list is identical for all drive parameters. Even parameters that can only be read receive the attribute READ ALL/WRITE ALL in the object list because the MOVIMOT[®] performs the corresponding check itself and provides a return code, if necessary. The following table shows the object description for all drive parameters.

Index:	8300 to 8313
Object code	7 (simple variable)
Data type index	10 (octet string)
Length	4
Local address	
Password	
Access groups	
Access rights	READ ALL/WRITE ALL
Name [16]	-
Extension length	-



"Variable data channel with acyclical routing" object

This object lets you address all MQI and MOVIMOT[®] parameters. The object contains a selection list of the sub channel and address information to select the target unit. It contains information on the data length and frame type as well as an acyclic MOVILINK[®] parameter channel. Enter the service and data value you required here. The length is fixed to 12 bytes.

Octet	0	1	2	3	4	5	6	7	8	9	10	11
Meaning	Sub channel	Sub address	Frame type	Data length	Management	Reserved	Index high	Index low	MSB data	Data	Data	LSB data
Fine division	Sub channel	Sub address	Frame type	Data length	Management	Reserved	Parameter list	4-byte data				
Rough division	Routing information				MOVILINK [®] parameter channel, acyclic							

The sub channel decides which interface the data is transmitted to. The value "0" means that the parameters of the MQI are addressed themselves. In this case, the sub address has no importance. The value "1" addresses the standard interface. For MQI, this is the RS-485 interface to the connected MOVIMOT[®].

The sub address lets you select the target unit. If you want to address the parameters of a MOVIMOT[®] connected to MQI via RS-485, enter the RS-485 address of the desired MOVIMOT[®] here.

The frame type must be fixed to the value 86_{hex} (only acyclic parameter data). The data length for this frame type is set to 8 byte.

This chapter contains information on the "acyclic" MOVILINK[®] parameter channel

Variable data channel performs a WRITE type service

When a WRITE type service is executed via the data channel (e.g. WRITE PARAMETER or WRITE PARAMETER VOLATILE), the MQI responds with the current confirmation once the service has been performed. An incorrect write access returns the corresponding error code.

This variant offers the advantage that the write services are processed simply by sending a WRITE "MOVILINK[®] parameter channel" once and the confirmation can take place by evaluating the "WRITE CONFIRMATION". The following table shows the execution of write services via the variable data channel.

Controller (master)	MQI (slave)
Initiate the execution of the service coded in the parameter channel with WRITE to the "Variable data channel" object.	
WRITE 8288 (variable data channel) → Confirmation (OK/Error code) ←	

The WRITE service coded in the parameter channel is executed and the confirmation is returned immediately as response.



Variable data channel performs a READ type service

To read a parameter via the data channel, a PCP WRITE service must be executed first. The PCP WRITE service specifies where the data of the MQI is available. A read service must be executed on the variable data channel so that this data can reach the master. Consequently, to execute the read services via the variable data channel, you always have to execute PCP WRITE and then PCP READ. The following table shows the execution of read services via the variable data channel.

Controller (master)	MQI (slave)
1. Initiate the execution of the service coded in the parameter channel with WRITE to the "Variable data channel" object.	
WRITE 8288 (variable data channel) → OK ←	
2. READ Variable data channel and evaluation of the confirmation in the parameter channel	
READ 8288 (variable data channel) → Data = variable data channel with result ←	

1. Receipt is confirmed immediately; data channel is evaluated and the requested service is executed.
2. The confirmation is entered in the data channel and can be evaluated via READ access in the master.

The "Variable data channel with acyclical routing" object is handled locally on the field-bus interface and is defined as shown in the following tables.

Index:	8288
Object code	11 (string variable)
Data type index	10 (octet string)
Length	12
Local address	
Password	
Access groups	
Access rights	READ ALL/WRITE ALL
Name [16]	-
Extension length	-



"Download parameter block" object

The "Download parameter block" object can be used to write a maximum of 38 MQI drive parameters or one of the MOVIMOT[®] connected to the MQI at the same time with a single write service. This object lets you set the parameters of a MOVIMOT[®] with a single call of the write service, such as during the starting phase. You will usually only change a few parameters and the parameter block with its maximum 38 parameters is sufficient for almost all applications. The user data area is set to $38 \times 6 + 2 \text{ Byte} = 230 \text{ Byte}$ (Type Octet String). The following table shows the structure of the "Download parameter block" object.

Octet	Meaning	Comment
0	Address	Target address: 0 or 254 for MQI RS-485 address for MOVIMOT [®]
1	Number of parameter	1 to 38 parameters
2	Index high	1. Parameter
3	Index low	
4	MSB data	
5	Data	
6	Data	
7	LSB data	
8	Index high	2. Parameter
...	...	
223	LSB data	
224	Index high	38. Parameter
225	Index low	
226	MSB data	
227	Data	
228	Data	
229	LSB data	

The "Download parameter block" object is handled locally on the fieldbus interface and defined as listed in the following tables.

Index:	8296
Object code	7 (simple variable)
Data type index	10 (octet string)
Length	230
Local address	
Password	
Access groups	
Access rights	WRITE ALL
Name [16]	-
Extension length	-



Using the WRITE service to address the "Download parameter block" object, the MQI starts a parameter setting mechanism that writes all defined parameters in the user data area of the object to the MQI or a connected MOVIMOT®. In doing so, it sets the parameters of the MQI or MOVIMOT®. MQI is addressed using the address 0 or 254. One of the MOVIMOT® units connected to the MQI is addressed with its RS-485 address. After successful processing of the download parameter block, i.e. all parameters transferred by the INTERBUS interface module have been written, the write service is ended with a positive WRITE response. In the event of a fault, a negative WRITE response is returned. The return code contains more detailed information on the type of fault, as well as the number of the parameter (no. 1 to 38) in which the fault occurred (see the following example).

```
Example: Error writing the 11. parameter Write Error Response:
Error class: 8 Other
Error code: 0 Other
Additional code high: 11dec error writing parameter 11
Additional code low: 15hex value too high
```



TIP

Observe the following when using the download parameter block:

- Do not execute any factory setting within the download parameter block.
- After activating a parameter lock, all subsequently written parameters are rejected.

"Last PCP index" object

This object is 4 bytes long and, when read access is made, it returns the numerical value of the last index which can be addressed directly using the PCP services. PCP accesses to indices that are higher than this numerical value must be performed using object 8288 "Variable data channel with acyclic routing". Access is also possible using object 8299 "Acyclic MOVILINK® parameter channel" to address the MQI parameters.

Index	8297
Object code	7 (simple variable)
Data type index	10 (octet string)
Length	4
Local address	
Password	
Access groups	
Access rights	READ ALL
Name [16]	-
Extension length	-



"Acyclic MOVILINK® parameter channel"

The "Acyclic MOVILINK® parameter channel" object is 8 bytes long and contains the MOVILINK® parameter channel. This object can be used for acyclic parameter access to the MQI. Thus the MQI processes the service that has been coded in the parameter channel with each WRITE service on this object. The handshake bit is not evaluated. The following table shows the structure of the "Acyclic MOVILINK® parameter channel" object

Octet	0	1	2	3	4	5	6	7
Meaning	Management	Reserved	Index high	Index low	MSB data	Data	Data	LSB data
Comment	Management	Reserved	Parameter list		4-byte data			

2 different operations are involved when setting the drive inverter parameters via the acyclic MOVILINK® parameter channel:

- Parameter channel performs a WRITE service
- Parameter channel performs a READ service

Parameter channel performs a WRITE service

When a WRITE type service is executed via the acyclic parameter channel (e.g. WRITE PARAMETER or WRITE PARAMETER VOLATILE), the MQI responds with the current confirmation once the service has been performed. An incorrect write access returns the corresponding error code.

This variant offers the advantage that the write services are processed simply by sending a WRITE "MOVILINK parameter channel" once and the confirmation can take place by evaluating the "WRITE CONFIRMATION". The following table shows the execution of write services via the acyclic MOVILINK® parameter channel.

Controller (master)	MQI (slave)
Initiate the service coded in the parameter channel by means of a WRITE to the "Acyclic MOVILINK® parameter channel" object	
WRITE 8299 (parameter channel) → Confirmation (OK/Error code) ←	

The WRITE service coded in the parameter channel is executed and the confirmation is returned immediately as response.



Parameter channel performs a READ service

To read a parameter via the parameter channel, it is necessary to execute a PCP WRITE service first. The PCP WRITE service specifies where the data of the MQI is available. A read service must be executed on the acyclic parameter channel so that this data can reach the master. Consequently, to execute the read services via the parameter channel, you always have to execute PCP WRITE and then PCP READ. The following table shows the execution of read services via the acyclic MOVILINK[®] parameter channel.

Controller (master)	MQI (slave)
1. Initiate the service coded in the parameter channel by means of a WRITE to the "Acyclic MOVILINK [®] parameter channel" object	
	WRITE 8299 (parameter channel) → OK ←
2. READ "Cyclic MOVILINK [®] parameter channel" and evaluation of the confirmation in the parameter channel.	
	READ 8299 (parameter channel) → Data = parameter channel with result ←

1. Receipt is confirmed immediately; parameter channel is evaluated and requested service is executed.
2. Confirmation is entered into parameter channel and can be evaluated via READ access in the master.

The acyclical MOVILINK[®] parameter channel is handled locally on the MQI and is defined according to the following table.

Index	8299
Object code	7 (simple variable)
Data type index	10 (octet string)
Length	8
Local address	
Password	
Access groups	
Access rights	READ ALL/WRITE ALL
Name [16]	-
Extension length	-



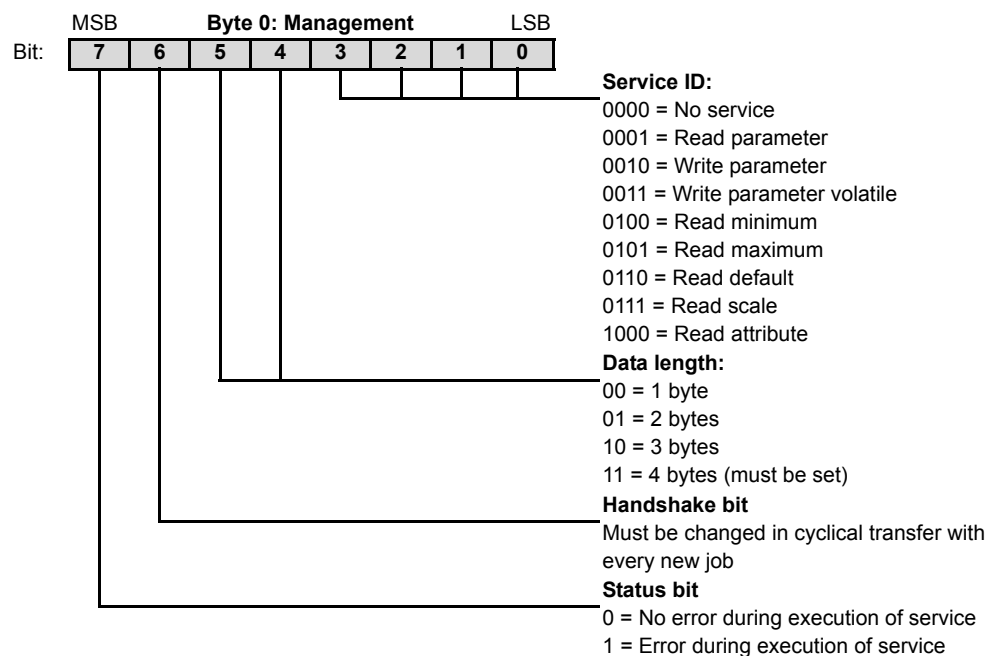
12.3.4 Structure of the parameter channel

The following table shows the structure of the parameter channel. It is made up of a management byte, an index word, a reserved byte and 4 data bytes.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	MSB data	Data	Data	LSB data
Management	Reserved=0	Parameter list		4-byte data			

12.3.5 Management of the parameter channel

The entire parameterization sequence is coordinated with byte 0 (management). This byte provides important service parameters such as service identifier, data length, version and status of the service performed. The following figure shows that bits 0, 1, 2 and 3 contain the service identifier, and define which service is performed. Bit 4 and bit 5 specify the data length in bytes for the write service; it should be set to 4 bytes for all SEW parameters.



Bit 6 is used as an acknowledgment between the controller and the MQI. It triggers the implementation of the transmitted service in the MQI.



12.3.6 Reserved byte

Byte 1 is reserved and must be set to 0x00.

12.3.7 Index addressing

Byte 2 (Index high) and byte 3 (Index low) determine the parameter to be read or written via the fieldbus system. The parameters of the MQI or connected MOVIMOT® drive are addressed with a uniform index regardless of the connected fieldbus system. Chapter "Parameters (see page 161)" contains all MQx parameters with index.

12.3.8 Data range

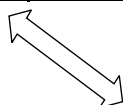
As the following table shows, the data is contained in bytes 4 - 7 of the parameter channel. This means up to 4 bytes of data can be transmitted per service. The data is always entered with right-justification; that is, byte 7 contains the least significant data byte (Data LSB) whereas byte 4 is the most significant data byte (Data MSB).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	MSB data	Data	Data	LSB data
				High byte 1	Low byte 1	High byte 2	Low byte 2
				High word		Low word	
				Double word			

12.3.9 Incorrect service execution

The status bit in the management byte is set to signal that a service has been executed incorrectly. If the received handshake bit is identical to the transmitted handshake bit, the MQI has executed the service. If the status bit now signals an error, the error code is entered in the data range of the parameter telegram. Bytes 4 - 7 provide the return code in a structured format. Refer to section "Return codes of parameterization" (see page 132) for additional information.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	Error class	Error code	Add. code high	Add. code low



Status bit = 1: Incorrect service execution



12.4 Return codes of the parameterization

In case of incorrect parameter setting, the MQI returns various *return codes* to the parameterizing master. The codes offer detailed information on the cause for the error. All of these *return codes* are structured according to EN 50170. The MQP distinguishes between the following elements:

- *Error class*
- *Error code*
- *Additional code*

These return codes are valid for all MQI communication interfaces

12.4.1 Error class

The *error class* element provides a more exact classification of the error type. The MQI supports the following error classes defined in accordance with EN 50170(V2):

Class (hex)	Designation	Meaning
1	vfd state	Status error of the virtual field device
2	application reference	Error in application program
3	definition	Definition error
4	resource	Resource error
5	service	Error during execution of service
6	access	Access error
7	OV	Error in the object list
8	other	Other error (section "Additional code (see page 133))

The *Error class* is generated by the communication software of the fieldbus interface in the event of an error in communication. The error can be identified more precisely using the elements *Error code* and *Additional code*.

12.4.2 Error code

The *Error code* element provides a means of identifying the cause of the error within the *Error class* more precisely. It is generated by the communication software of the MQI in the event of an error in communication. For *Error class* 8 = "Other error", only *Error code* = 0 "Other error code" is defined. In this case, detailed identification is made using the *additional code*.



12.4.3 Additional code

The *Additional code* contains SEW-specific *Return codes* for incorrect parameter setting of the MQI. They are returned to the master under *Error class 8* = "other error". The following table shows all coding possibilities for the *Additional code*.

Error class: 8 = "Other error"

Additional code high (hex)	Additional code low (hex)	Meaning
00	00	No error
00	10	Invalid parameter list
00	11	Function/parameter not implemented
00	12	Read access only
00	13	Parameter lock is active
00	14	Factory setting is active
00	15	Value for parameter too large
00	16	Value for parameter too small
00	17	Required option card missing for this function/parameter
00	18	Error in system software
00	19	Parameter access via RS-485 process interface on X13 only
00	1A	Parameter access via RS-485 diagnostic interface only
00	1B	Parameter is access-protected
00	1C	Controller inhibit required
00	1D	Invalid value for parameter
00	1E	Factory setting was activated
00	1F	Parameter was not saved in EEPROM
00	20	Parameter cannot be changed with enabled output stage
00	21	Copypen end string reached
00	22	Copypen not enabled
00	23	Parameter may only be changed with IPOS program stop
00	24	Parameter may only be changed with deactivated Autosetup

12.4.4 Special *Return codes* (special cases)

Errors in parameter settings that cannot be identified either automatically by the application layer of the fieldbus system or by the system software of the MQI module are treated as special cases. The possible causes for such errors are as follows:

- Incorrect coding of a service via parameter channel
- Incorrect length specification of a service via parameter channel
- Project planning error in station communication



12.4.5 Incorrect service code in the parameter channel

An illegal service identifier was specified in the management byte during configuration via parameter channel. The following table shows the *Return code* for this special case.

	Code (dec)	Meaning
Error class:	5	Service
Error code:	5	Illegal parameter
Add. code high:	0	-
Add. code high:	0	-

12.4.6 Incorrect length specification in parameter channel

A data length other than 4 data bytes was specified in a write service during configuration via the parameter channel. The following table displays the return codes.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	8	Type conflict
Add. code high:	0	-
Add. code high:	0	-

Troubleshooting:

Check bit 4 and bit 5 for the data length in the management byte of the parameter channel.

12.4.7 Project planning error in "station communication"

The return code listed in the following table is returned if an attempt is made to issue a parameter service to a station even though no parameter channel was configured for the station.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	1	Object not existent
Add. code high:	0	-
Add. code high:	0	-

Troubleshooting:

Configure a parameter channel for the desired station.

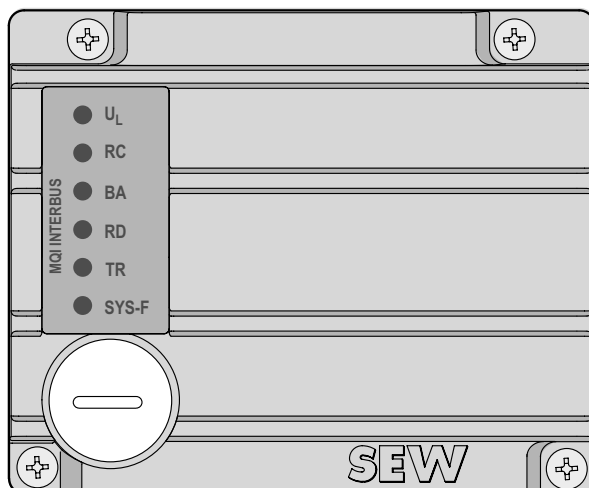
12.5 INTERBUS peripheral fault

The INTERBUS interfaces can report fault 83 short-circuit output also as peripheral fault to the INTERBUS master: You can reset the faults via the CMD tool in the INTERBUS master (interface module, right-click: Operate/Other services/Accept module error).



12.6 Meaning of the LED display

The MQI INTERBUS interface has 5 LEDs for INTERBUS diagnostics and a further LED for displaying system faults.



1389537547

12.6.1 LED UL "U Logic" (green)

Status	Meaning	Remedy
On	Supply voltage is present	-
Off	Supply voltage is missing	Check the DC 24 V voltage supply and wiring of the MQI.

12.6.2 LED RC "Remote Bus Check" (green)

Status	Meaning	Remedy
On	Incoming remote bus connection is functioning properly	-
Off	Incoming remote bus connection is malfunctioning	Check the incoming remote bus cable

12.6.3 LED BA "Bus Active" (green)

Status	Meaning	Remedy
On	Data transfer on INTERBUS is active	-
Off	No data transfer; INTERBUS stopped	- Check the incoming remote bus cable - Use the diagnostic display on the master interface module to localize the fault further
Flashing	Bus active, no cyclical data transmission	-



12.6.4 LED RD "Remote Bus Disable" (red)

Status	Meaning	Remedy
On	Outgoing remote bus is switched off (only in case of an error).	-
Off	Outgoing remote bus not switched off	-

12.6.5 LED TR "Transmit" (green)

Status	Meaning	Remedy
On	Parameter data exchange via PCP	-
Off	No parameter data exchange via PCP	-

12.6.6 LED SYS-F "System fault" (red)

Status	Meaning	Remedy
Off	- Normal operating state - The MQI is exchanging data with the connected MOVIMOT® drives	-
Flashing Regularly	- The MQI is in error state - An error message is displayed in the MOVITOOLS® status window.	Please observe the corresponding error description (section "Fieldbus interfaces – error table" (see page 169))
On	- The MQI is not exchanging data with the connected MOVIMOT® - The MQI was not configured, or the connected MOVIMOT® units do not respond.	- Check the wiring of the RS-485 between MQI and connected MOVIMOT® as well as the voltage supply of MOVIMOT®. - Check whether the addresses set on the MOVIMOT® correspond to the addresses set in the IPOS program (MovcommDef command). - Check whether the IPOS program has been started
	Maintenance switch on the field distributor is set to OFF	Check setting of maintenance switch on field distributor



12.7 Error states

12.7.1 Fieldbus timeout

Switching off the fieldbus master or an open circuit of the fieldbus cabling results in to a fieldbus timeout at the MQI. The connected MOVIMOT[®] drives are stopped by sending 0 in each process output data word. In addition, the digital outputs are set to "0".

This corresponds, for example, to a rapid stop at control word 1.

	TIP
	When the MOVIMOT[®] drive is controlled with 3 process data words, the ramp is specified with 0 s in the 3rd word The "Fieldbus timeout" error resets itself automatically. The MOVIMOT[®] drives will receive the current process output data again from the controller as soon as the fieldbus communication has been reestablished.

This error response can be deactivated via P831 in MOVITOOLS[®] Shell.

12.7.2 RS-485 timeout

If one or more MOVIMOT[®] drives can no longer be addressed by the MQI via RS-485, error code 91 "System fault" is displayed in status word 1. The "SYS-F" LED lights up. The error is also transmitted via diagnostics interface.

MOVIMOT[®] drives that do not receive any data will stop after 1 second. This step requires that the data exchange between MQI and MOVIMOT[®] is carried out via MOVCOMM commands. MOVIMOT[®] drives that continue to receive data can be controlled as usual.

The timeout resets itself automatically, i.e. the current process data are immediately exchanged again with the unavailable MOVIMOT[®] after restart of the communication.

12.7.3 Unit faults

The MQI fieldbus interfaces can detect a series of hardware defects. After detecting a hardware defect, the devices are inhibited. The exact fault responses and remedial measures are listed in the section "Fault table for fieldbus interfaces". (see page 169)

A hardware defect causes fault 91 to be displayed in the process input data in status word 1 of all MOVIMOT[®] units. The "SYS-F" LED on the MQI module flashes regularly.

The exact fault code can be displayed via the diagnostics interface in MOVITOOLS[®] in the MQI status. The error code can be read and processed in the IPOS program with the command "GETSYS".



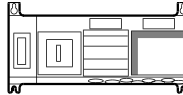
13 Supplementary Field Distributor Startup Information

Depending on the fieldbus interface, startup is performed according to sections:

- Startup with MFI.. INTERBUS Interface (copper Line) (see page 81)
- Startup with MFI.. INTERBUS interface (fiber optic cable) (see page 97)
- Startup with MQI.. INTERBUS Interface (copper Line) (see page 113)

In addition, please observe the following notes about the startup of field distributors.

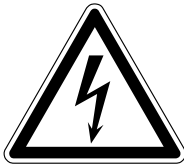
13.1 MF../Z.6., MQ../Z.6. field distributors



13.1.1 Maintenance switch

The maintenance/line protection switch of the Z.6. field distributor protects the hybrid cable against overload and switches the following MOVIMOT® components:

- Power supply and
- DC 24 V supply



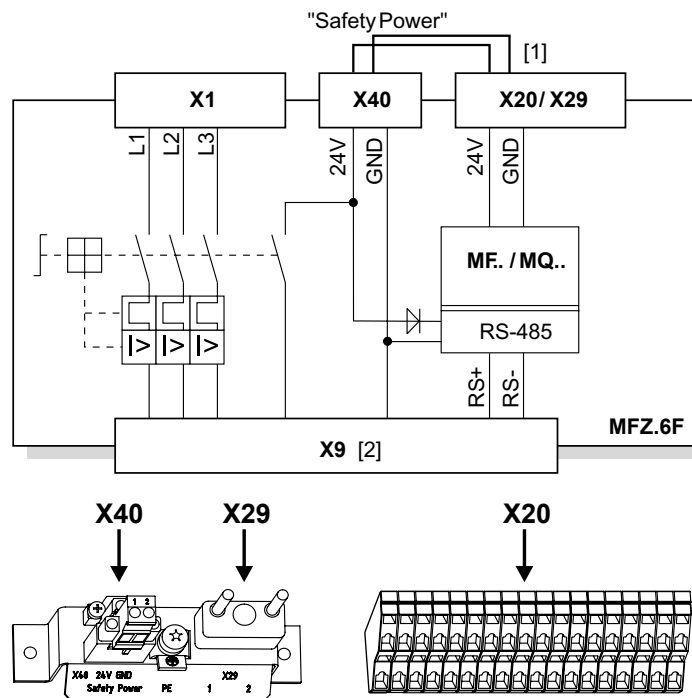
! DANGER

The maintenance/line protection switch disconnects only the MOVIMOT® motor from the power supply system, not the field distributor.

Severe or fatal injuries from electric shock.

- Before working on the field distributor, de-energize it and safeguard it against unintentional power-up.

Block diagram:



1162524811

- [1] Jumper for supply of MOVIMOT® from DC 24 V voltage for fieldbus module MF../MQ.. (wired at factory)
- [2] Hybrid cable connection



For brake motors: Do not install brake rectifiers inside the terminal box of the motor.

The diagram illustrates the electrical connections for a MOVIMOT® system. Key components and connections include:

- Terminal X1:** Labeled L1, L2, L3.
- Terminal X40:** Labeled 24V, GND.
- Terminal X20 / X29:** Labeled 24V, GND.
- RS-485 Interface:** Labeled MF. / MQ.., RS+, RS-, RS-485.
- MOVIMOT®:** Labeled U, V, W, 13, 14, 15, TH1, TH2.
- Terminal X9 [2]:** Labeled 1, 2.
- Safety Power:** Indicated by a line from the top.
- MFZ.7F:** A label on the right side of the diagram.

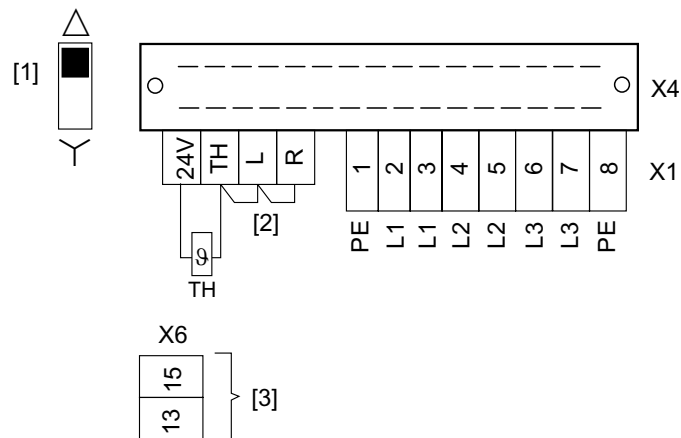
Below the main diagram, three detailed views of terminal blocks are shown:

- X40:** A terminal block with 24V, GND, and PE connections.
- X29:** A terminal block with 1, 2, and 3 connections.
- X20:** A large terminal block with multiple connections.

- [1] Jumper for supply of MOVIMOT® from DC 24 V voltage for fieldbus interface MF../MQ.. (wired at factory)
- [2] Hybrid cable connection



13.2.2 Internal wiring of the MOVIMOT® inverter in the field distributor



1186911627

- [1] DIP switch for setting the connection type
Make sure that the connection type of the connected motor matches the DIP switch setting.

- [2] **Note the enabled direction of rotation**
 (Both directions of rotation are enabled as standard)

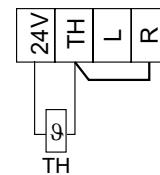
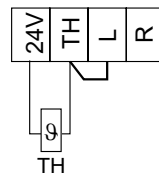
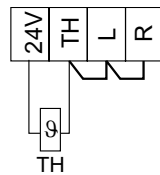
Both directions
are enabled

Only direction

counterclockwise is enabled

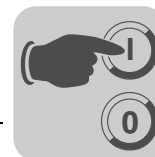
Only direction

clockwise is enabled

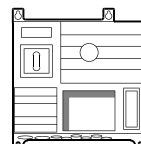


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- [3] Connection for internal braking resistor (in motors without brake only)



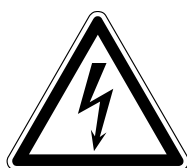
13.3 MF../MM../Z.8., MQ../MM../Z.8. field distributors



13.3.1 Maintenance switch

The maintenance switch of the Z.8. field distributor switches the following MOVIMOT® components:

- Power supply and
- DC 24 V supply



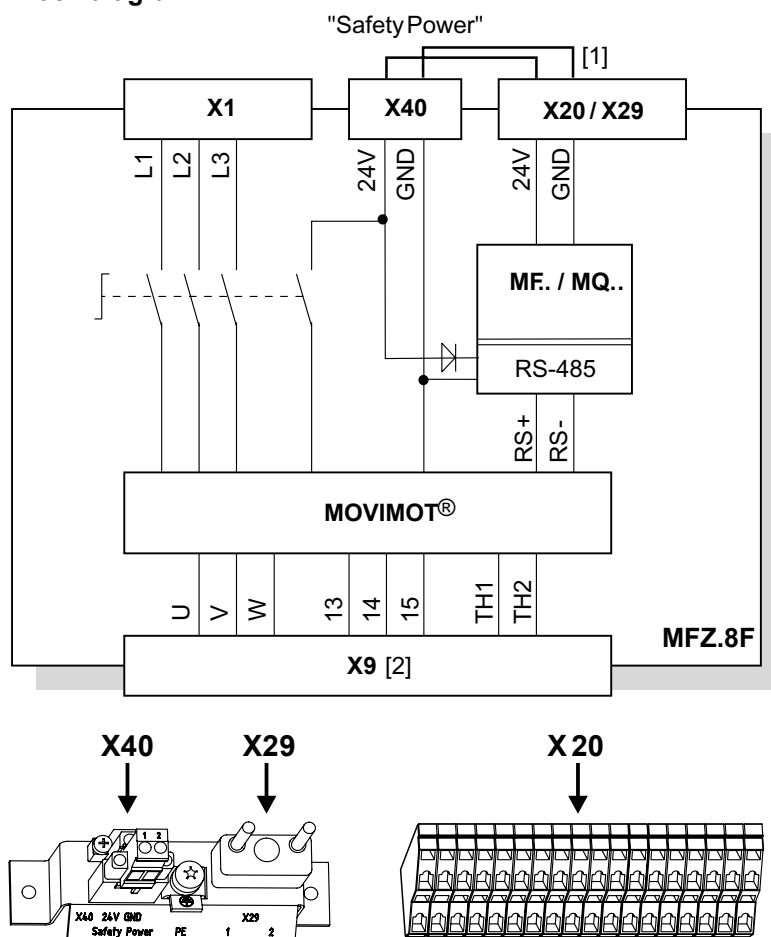
! DANGER

The maintenance/line protection switch disconnects only the MOVIMOT® motor from the power supply system, not the field distributor.

Severe or fatal injuries from electric shock.

- Before working on the field distributor, de-energize it and safeguard it against unintentional power-up.

Block diagram:



1186927371

- [1] Jumper for supply of MOVIMOT® from DC 24 V voltage for fieldbus interface MF../MQ.. (wired at factory)
- [2] Hybrid cable connection



13.3.2 Checking the connection type of the motor

Use the following figure to check that the selected connection type is identical for the field distributor and the connected motor.



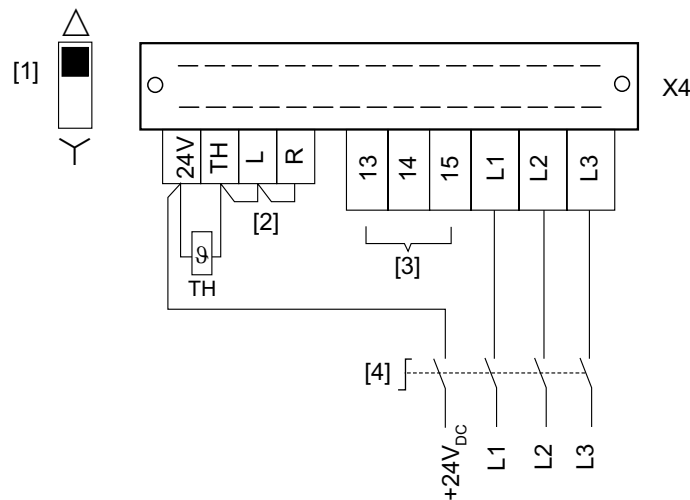
1162529803



TIP

For brake motors: Do not install brake rectifiers inside the terminal box of the motor.

13.3.3 Internal wiring of the MOVIMOT® inverter in the field distributor



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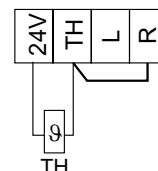
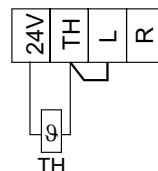
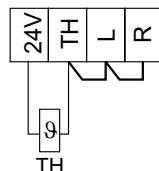
- [1] DIP switch for setting the connection type
Make sure that the connection type of the connected motor matches the DIP switch setting.

- [2] **Note the enabled direction of rotation**
 (Both directions of rotation are enabled as standard)

Both directions
are enabled

Only direction

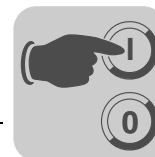
counterclockwise is enabled **clockwise** is enabled



1186918667

- [3] Connection for internal braking resistor (in motors without brake only)

- [4] Maintenance switch



13.4 MOVIMOT® frequency inverter integrated in the field distributor

The following section describes the changes that are necessary to operate the MOVIMOT® inverter integrated in the field distributor compared to the use of the inverter when it is integrated in the motor.

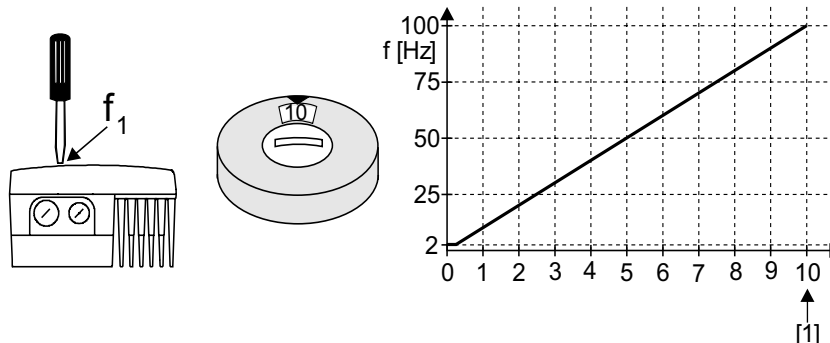
13.4.1 Changed factory settings of MOVIMOT® integrated in the field distributor

Note the **changes to the factory settings when using MOVIMOT® integrated in Z.7. or Z.8. field distributors.** The remaining settings are identical with MOVIMOT® integrated in the motor. Refer to the operating instructions of the respective MOVIMOT® drive.

DIP switch S1:

S1 Meaning	1	2	3	4	5 Motor protec- tion	6 Motor power rating	7 PWM Frequency	8 No-load damping
	2 ⁰	2 ¹	2 ²	2 ³				
ON	1	1	1	1	Off	Motor one size smaller	Variable (16, 8, 4 kHz)	On
OFF	0	0	0	0	On	Adjusted	4 kHz	Off

Setpoint potentiometer f1:



1186982667

[1] Factory setting



13.4.2 Additional functions of MOVIMOT[®] integrated in the field distributor

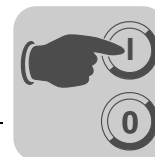
The following additional functions are available when MOVIMOT[®] is integrated in the Z.7. field distributor / Z.8. (to a limited extent). A detailed description of the additional functions can be found in the respective MOVIMOT[®] operating instructions.

Additional function		Restriction
1	MOVIMOT [®] with increased ramp times	–
2	MOVIMOT [®] with adjustable current limitation (fault if limit is exceeded)	–
3	MOVIMOT [®] with adjustable current limitation (can be changed using terminal f1/f2)	Not available
4	MOVIMOT [®] with bus configuration	Only possible with MQ.. fieldbus interfaces
5	MOVIMOT [®] with motor protection in Z.7. field distributor / Z.8.	Parameter settings can only be made for the bus in combination with the MQ.. fieldbus interface
6	MOVIMOT [®] with maximum PWM frequency of 8 kHz	–
7	MOVIMOT [®] with rapid start / stop	The mechanical brake can only be controlled by MOVIMOT[®]. Do not control the brake using the relay output.
8	MOVIMOT [®] with minimum frequency 0 Hz	–
10	MOVIMOT [®] with minimum frequency 0 Hz and reduced torque at low frequencies	–
11	Monitoring of supply-phase failure deactivated	–
12	MOVIMOT [®] with quick start/stop and motor protection in Z.7. and Z.8. field distributors	The mechanical brake can only be controlled by MOVIMOT[®]. Do not control the brake using the relay output.
14	MOVIMOT [®] with deactivated slip compensation	–



TIP

Do not use additional function 9 "MOVIMOT[®] for hoist applications" and additional function 13 "MOVIMOT[®] for hoist applications with extended n-monitoring" when the MOVIMOT[®] inverter is integrated in the Z.7./Z.8. field distributors.

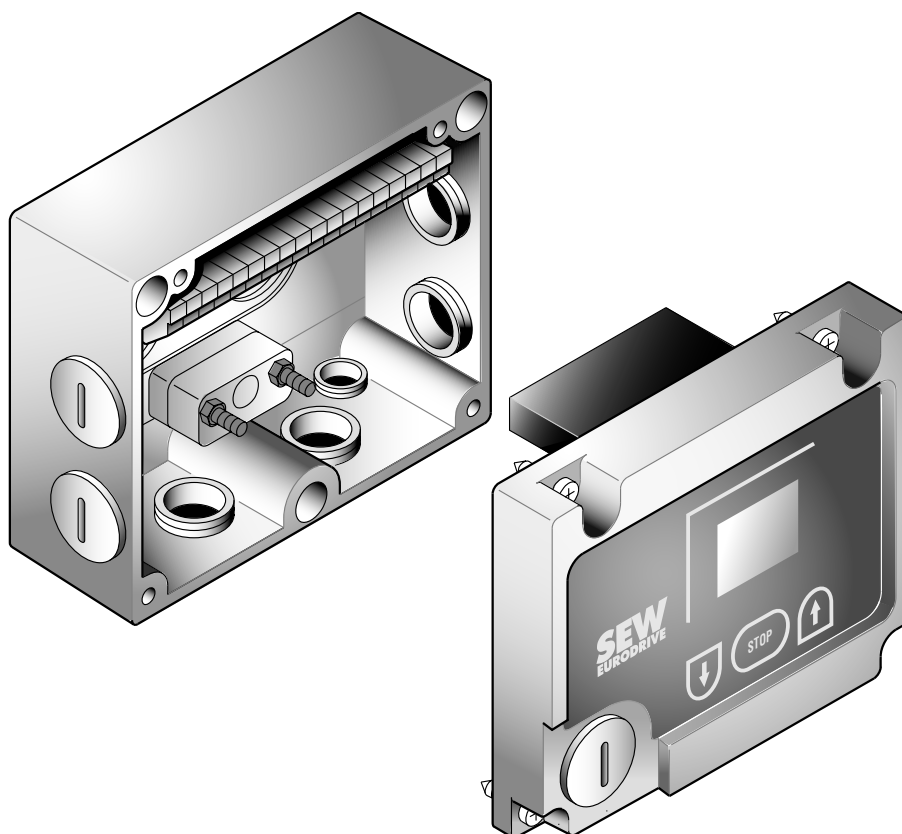


14 Operator Terminals

14.1 MFG11A keypad

14.1.1 Function

The MFG11A keypad is plugged onto any MFZ.. connection module instead of a fieldbus interface for manual control of a MOVIMOT® drive.



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14.1.2 Use

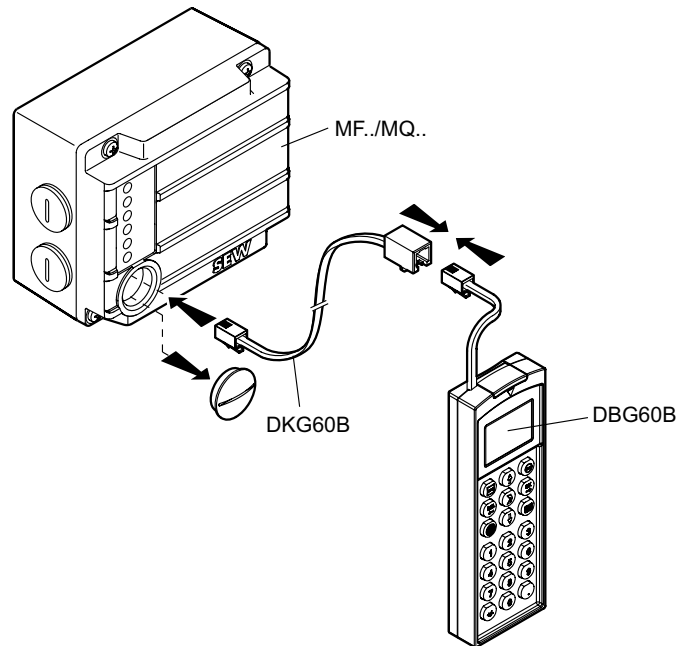
Operation of the MFG11A option	
Display	Negative display value e.g.  = counterclockwise Positive display value e.g.  = clockwise The display value is based on the speed set using the setpoint potentiometer f1. Example: Display "50" = 50% of the speed set with the setpoint potentiometer. Important: If the display is "0," the drive is rotating at f_{min}.
Increase the speed	For CW direction:  For CCW direction: 
Reducing the speed	For CW direction:  For CCW direction: 
Inhibit MOVIMOT®	Press the button:  Display = 
Enable MOVIMOT®	 or  Important: After enable, the MOVIMOT® drive accelerates to the speed and in the direction of rotation saved last.
Change direction of rotation from CW to CCW	1.  Until display =  2. Pressing  again changes direction of rotation from CW to CCW.
Change direction of rotation from CCW to CW	1.  Until display =  2. Pressing  changes direction of rotation from CCW to CW.
	TIP When the 24 V supply is switched back on, the module is always in STOP status (display = OFF). When selecting the direction using the arrow keys, the drive (setpoint) starts from 0.



14.2 DBG keypad

14.2.1 Connection to MF../MQ.. fieldbus interfaces

The DBG60B keypad is connected directly to the diagnostic interface of the MF../MQ.. fieldbus interface. You can also connect the keypad via a 5 m extension cable (DKG60B option).



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14.2.2 Function

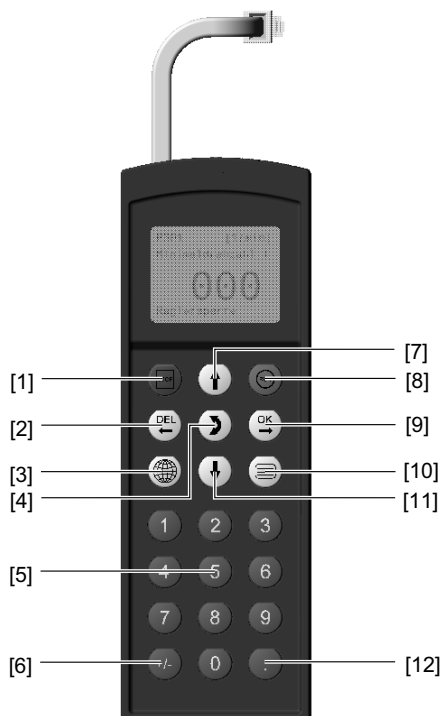
The DBG keypad enables manual operation of the MOVIMOT® drives. It offers the following functions:

- Parameter setting for MOVIMOT® drives
- Controlling the drives through the keypad
- Displaying the process data (monitor mode)
- Bus diagnostics



14.2.3 DBG key assignment

The following figure shows the key assignment of the DBG keypad:



341827339

- | | | |
|------|---|--|
| [1] | Key  | Stop |
| [2] | Key  | Delete previous entry |
| [3] | Key  | Select language |
| [4] | Key  | Change menu |
| [5] | Keys <0> – <9> | Digits 0 – 9 |
| [6] | Key  | Sign reversal |
| [7] | Key  | Up arrow, moves up to the next menu item |
| [8] | Key  | Start |
| [9] | Key  | OK, confirms the entry |
| [10] | Key  | Activate the context menu |
| [11] | Key  | Down arrow, moves down to the next menu item |
| [12] | Key  | Decimal point |

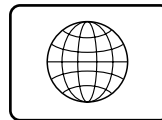


14.2.4 Selecting the required language

The following text appears on the display for a few seconds when the DBG keypad is switched on for the first time or after activating the delivery status:

SEW
EURODRIVE

The symbol for language selection then appears on the display.



341888523

Proceed as follows to select a the required language:

- Press the  key.
- A list of languages is displayed on the screen.
- Use the  key or the  key to select the required language.
- Confirm the setting by using the  key.

The basic display is now shown in your chosen language.

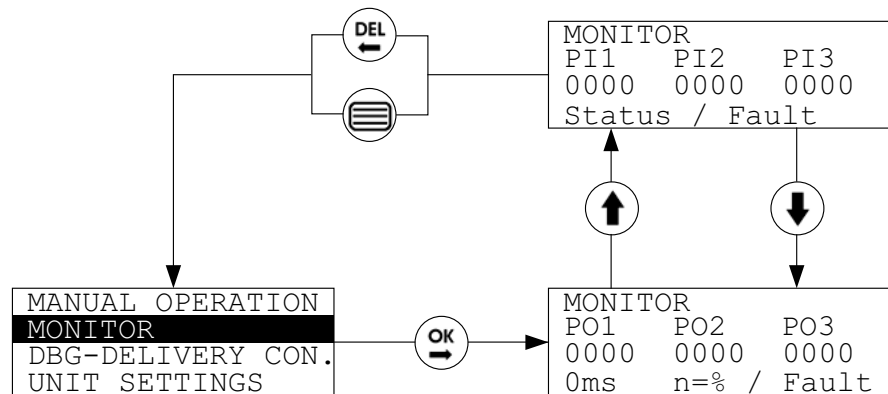


14.2.5 Monitor mode

Activation

- Connect the DBG keypad to the diagnostic interface of the fieldbus interface.

The unit designation of the connected MOVIMOT® drive is displayed for a few seconds. The DBG then switches to monitor mode.



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If you are in a different mode and would like to go to the monitor mode, proceed as follows:

- Use the key to call up the context menu.
- Use the arrow keys or to select the menu item "MONITOR" in the context menu.
- Confirm your entry using the key.

The keypad is now in monitor mode.

In monitor mode, the process output data (PO) and process input data (PI) are displayed in 2 separate menus.

The PO data window is always displayed from the context menu.

- Press the key to switch from the PO data window to the PI data window.
- To return to the PO data window, press the key.

To go back to the context menu, press the key or the key.

*Display***Process output data**

The process output data is displayed as follows:

MONITOR		
PO1	PO2	PO3
0000	0000	0000
0ms	n=0% / Fault	

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- PO1 = Control word
- PO2 = Speed (%)
- PO3 = Ramp

The following is also displayed:

- Ramp in ms
- Speed in %
- Fault number and fault text displayed in turn in case of a fault

Process input data

The process input data is displayed as follows:

MONITOR		
PI1	PI2	PI3
0000	0000	0000
Status / FAULT		

1214716171

- PI1 = Status word 1
- PI2 = Output current
- PI3 = Status word 2

The following is also displayed:

- The status in the status line of the PI window or
- The Fault number and fault text displayed in turn in case of a fault

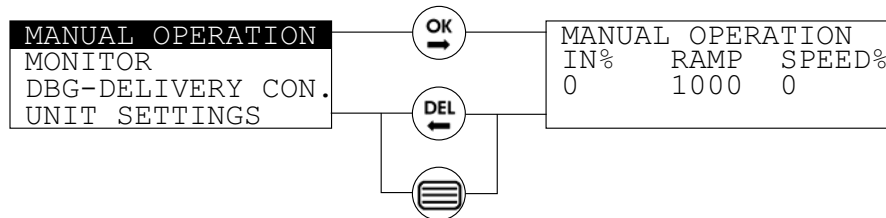


14.2.6 Manual mode

Activation

- Connect the DBG keypad to the diagnostic interface of the module.

The unit designation of the connected MOVIMOT® drive is displayed for a few seconds. The DBG then switches to monitor mode.



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Proceed as follows to change to manual mode:

- Use the key to call up the context menu.
- Use the arrow keys or to select the menu item "MANUAL OPERATION" from the context menu.
- Confirm your entry using the key.

The keypad is now in manual operation mode.

	TIP If the drive is enabled in automatic mode (bus operation), you cannot change to manual mode. In this case, the message "MANUAL OPERATION NOTE 17: INV. ENABLED" appears for 2 seconds and the DBG keypad returns to the context menu.
--	---

Display

In manual mode, the following is displayed:

MANUAL OPERATION		
IN%	RAMP	SPEED%
0	10000	0
ENABLE/NO ENABLE		

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- Display value: Output current in % of I_N
- Setting value: Ramp time in ms (default value 10000 ms)
- Setting value: Speed in % (default value 0%)

**Operation**

The following functions are available in the "MANUAL OPERATION" menu:

- | | |
|-----------------------|---|
| Speed setpoint in % | Use the  key or the  key to set the speed setpoint in %, or enter the value using the numeric keys <0> – <9>.
You can use the  key to invert the direction of rotation of the drive.
Confirm the entry with the  key. |
| Switch menu | To go to the menu for entering the ramp time, press the  key. |
| Setting the ramp time | Use the  key or the  key to set the ramp time, or enter the value using the numeric keys <0> – <9>.
Confirm the entry with the  key. |
| Starting the drive | To start the drive, press the  key.
The status bar now displays "ENABLE".
During operation, the keypad displays the current motor current in [%] of the rated motor current I_N . |
| Stopping the drive | To stop the drive, press the  key.
The message "NO ENABLE" now flashes in the status bar. |



 DANGER

When you exit manual operation mode, the keypad asks: "Activate automatic mode?"

If you select "OK", the drive switches to automatic mode immediately.

If the drive is enabled via bus signals, it can start unintentionally.

Severe or fatal injuries from crushing.

- Before deactivating manual mode, set the binary signals or the process data in such way that the drive is not enabled.
- Change the binary signals or process data only after deactivating manual operation.



Deactivating manual operation

Use the  key or the  key to deactivate the manual mode.

The following query appears:

ACTIVATE AUTOMATIC MODE?

- Press the  key, to return to manual mode.
- Press the  key, to deactivate manual mode and switch to automatic mode.

The context menu appears.

Resetting an error

If an error occurs during manual operation, the display shows an error window. The fault number and fault text are displayed alternatively (changing every 2 s) in the status bar of the error window.

Press the  key, to close the error window and reset the error.

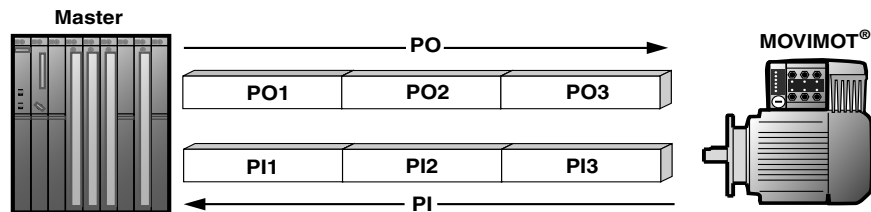


15 MOVILINK® Unit Profile

15.1 Coding of the process data

The same process data information is used for control and setpoint selection in all field-bus systems. The process data is coded according to the standard MOVILINK® profile for SEW drive inverters. The following variants are available for MOVIMOT® inverters:

- 2 process data words (2 PD)
- 3 process data words (3 PD)



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PO = Process output data
PO1 = Control word
PO2 = Speed (%)
PO3 = Ramp

PI = Process input data
PI1 = Status word 1
PI2 = Output current
PI3 = Status word 2

15.1.1 2 process data words

For controlling the MOVIMOT® inverter via 2 process data words, the higher-level controller sends the process output data "Control word" and "Speed [%]" to the MOVIMOT®. The MOVIMOT® inverter sends the process input data "Status word 1" and "Output current" to the higher-level controller.

15.1.2 3 process data words

When control uses 3 process data words, the ramp is sent as the additional process output data word and status word 2 is sent as the third process input data word.

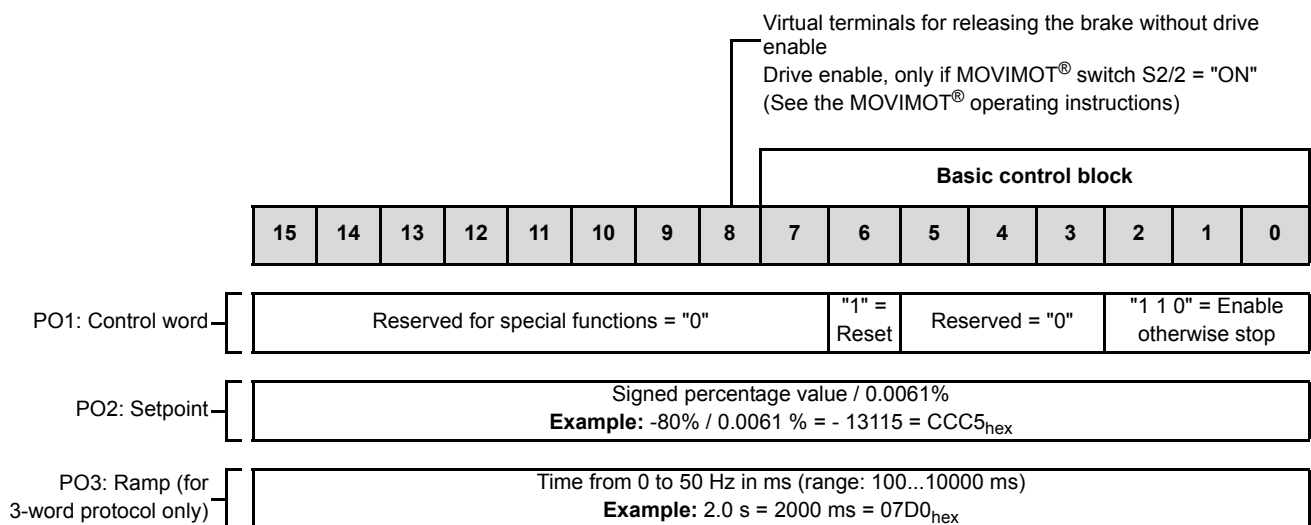


15.1.3 Process output data

Process output data is sent from the higher-level controller to the MOVIMOT® inverter (control information and setpoints). However, they only come into effect in MOVIMOT® if the RS-485 address in MOVIMOT® (DIP switches S1/1 to S1/4) is set to a value other than 0.

The MOVIMOT® drive can be controlled using the following process output data:

- PO1: Control word
- PO2: Speed [%] (setpoint)
- PO3: Ramp



Control word bit 0 – 2

The "Enable" control command is set with bits 0 – 2 by entering the control word = 0006_{hex}. The CW and/or CCW input terminal must also be set to +24 V (jumped) to enable the MOVIMOT® drive.

The "Stop" control command is issued by resetting bit 2 = "0." Use the stop command 0002_{hex} to enable compatibility with other SEW inverter series. MOVIMOT® always triggers a stop with the current ramp whenever bit 2 = "0," regardless of the status of bit 0 and bit 1.

Control word, bit 6 = reset

In the event of a malfunction, the fault can be acknowledged by setting bit 6 = "1" (Reset). For reasons of compatibility, any control bits not assigned must be set to the value "0".

Speed [%]

The speed setpoint is given as a relative value in percentage and refers to maximum speed set using the setpoint potentiometer f1.

Coding: C000_{hex} = -100% (counterclockwise direction)
 4000_{hex} = +100% (CW rotation)
 -> 1 digit = 0.0061%

Example: 80% f_{max}, CCW rotation:

Calculation: -80 % / 0.0061 = -13115_{dec} = CCC5_{hex}



Ramp

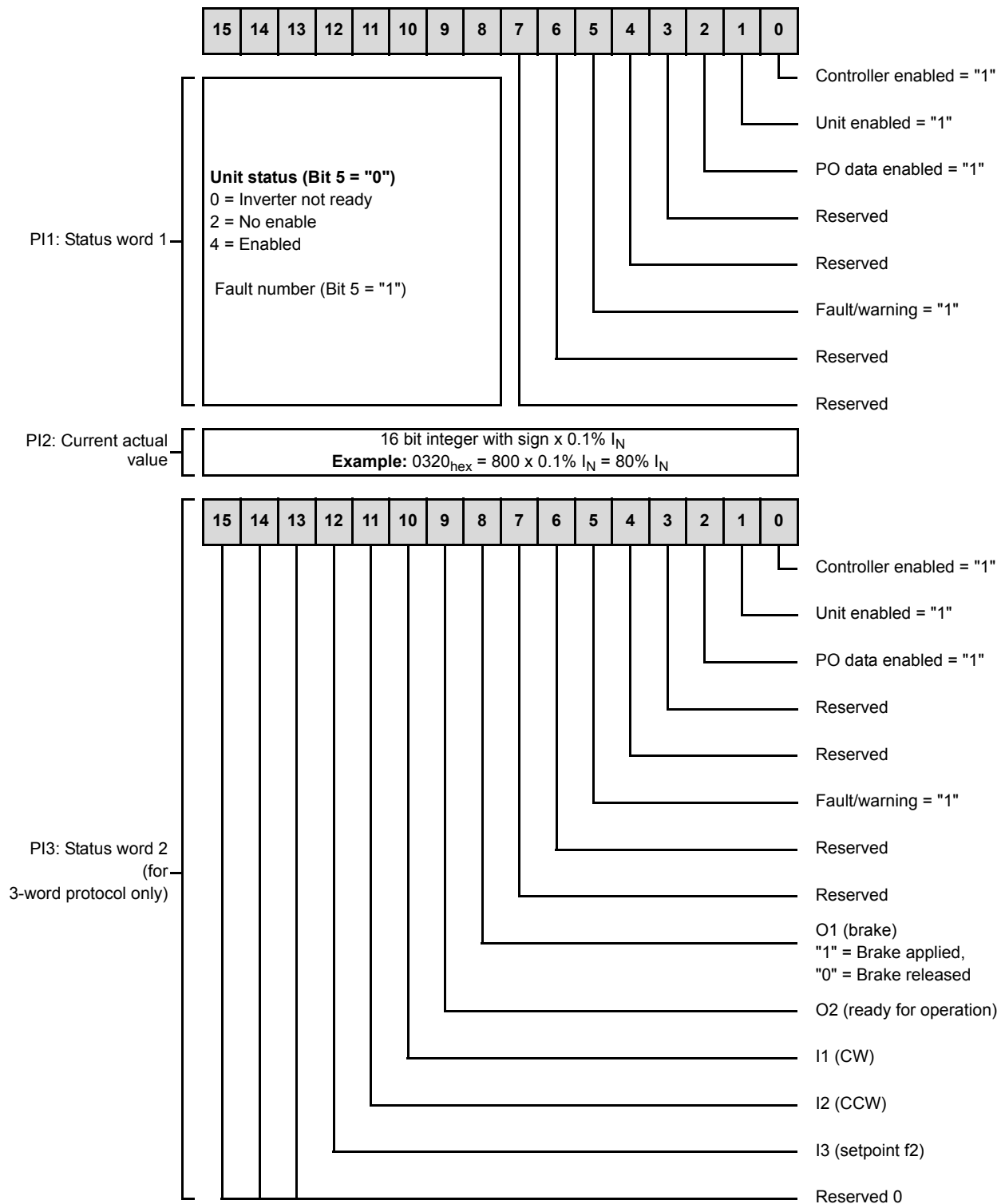
The current integrator in the process output data word PO3 is transferred if the process data exchange takes place using three process data words. The integrator ramp set with switch t1 is used if the MOVIMOT® drive is controlled using 2 process data words.

Coding: 1 digit = 1 ms
Range: 100 – 10000 ms
Example: 2.0 s = 2000 ms = 2000_{dec} = 07D0_{hex}

15.1.4 Process input data

The MOVIMOT® inverter sends the process input data back to the higher-level controller. The process input data contains information on statuses and actual values. The MOVIMOT® drive supports the following process input data:

- PI1: Status word 1
- PI2: Output current
- PI3: Status word 2





15.2 Sample program for Simatic S7 and fieldbus

A sample program for the Simatic S7 PLC illustrates the processing of process data as well as the digital inputs and outputs of the MF.. fieldbus interface.



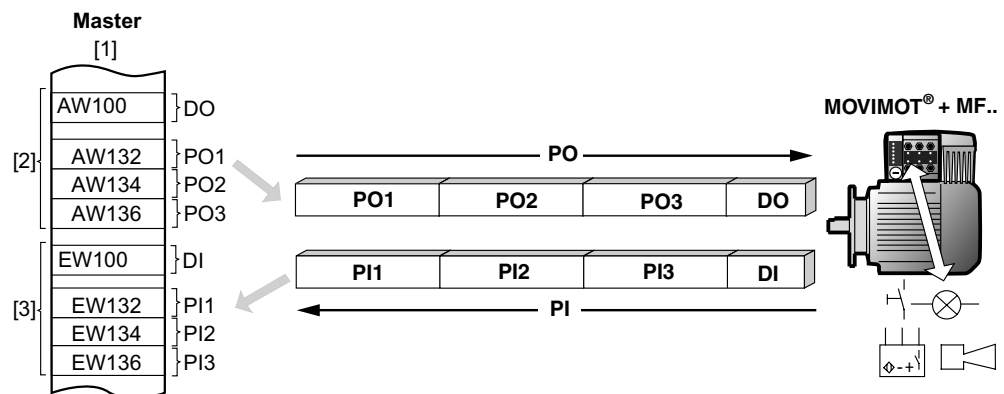
NOTE!

This section simply demonstrates how to create a PLC program using a non-binding example. SEW-EURODRIVE is not liable for the content of the sample program.

15.2.1 Address assignment of process data in the programmable controller

In the example, the process data of the MOVIMOT® fieldbus interface is stored in the PLC memory range PW132 – PW136.

The additional output/input word is administered in AW 100 and EW 100.



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[1] Address range	PO Process output data	PI Process input data
[2] Output addresses	PO1 Control word	PI1 Status word 1
[3] Input addresses	PO2 Speed [%]	PI2 Output current
	PO3 Ramp	PI3 Status word 2
	DO Digital outputs	DI Digital inputs

15.2.2 Processing the digital inputs/outputs of the MF.. fieldbus interface

The AND operation of digital inputs DI 0 – 3 controls the digital outputs DO 0 and DO 1 on the MF.. interface:

```

U E 100.0 // If DI 0 = "1"
U E 100.1 // DI 1 = "1"
U E 100.2 // DI 2 = "1"
U E 100.3 // DI 3 = "1"
= A 100.0 // then DO 0 = "1"
= A 100.1 // DO 1 = "1"
    
```



15.2.3 MOVIMOT® control

Input DI0 enables the MOVIMOT® drive:

- E 100.0 = "0:" Control command "Stop"
- E 100.0 = "1:" Control command "Enable"

Input DI1 sets the direction of rotation and speed:

- E 100.1 = "0:" 50% f_{max} clockwise direction
- E 100.1 = "1:" 50% f_{max} counterclockwise direction

The drive is accelerated and decelerated with an integrator ramp of 1 s.

The process input data is saved until further processing in the flag word 20 to 24.

```

U E 100.0    // Enter the "Enable" control command with input 100.0
SPB  FREE

L W#16#2    // "Stop" control command
T PAW 132   // Write to PO1 (control word 1)
SPA  SET

FREE: L W#16#6    // MOVIMOT control command "enable" (0006hex)
T PAW 132   // Write to PO1 (control word 1)

SETP: U E 100.1    // Set direction of rotation with input 100.1
SPB  CCW          // CCW operation if input 100.1 = "1"
L W#16#2000       // Setpoint speed = 50% fmax CW (=2000hex)
T PAW 134        // Write to PO2 (speed [%])
SPA  ACTV

CCW: L W#16#E000   // Setpoint speed = 50% fmax CCW (=E000hex)
T PAW 134        // Write to PO2 (speed [%])

ACTV: L 1000       // Ramp = 1 s (1000dez)
T PAW 136        // Write to PO3 (ramp)

L PEW 132        // Load PI1 (status word 1)
T MW 20          // and store in buffer
L PEW 134        // Load PI2 (output current)
T MW 22          // and store in buffer
L PEW 136        // Load PI3 (status word 2)
T MW 24          // and store in buffer

BE
  
```



16 Parameters

16.1 MQ.. parameter list

Parameter	Designation	Index	Unit	Access	Default	Meaning / value range
010	Inverter status	8310		RO	0	Low word coded, as status word 1
011	Operating state	8310		RO	0	Low word coded, as status word 1
012	Error status	8310		RO	0	Low word coded, as status word 1
013	Current parameter set	8310		RO	0	Low word coded, as status word 1
015	Hours of operation	8328	[s]	RO	0	
030	Binary input DI00	8844		RW	16	0: No function 16: IPOS input 32: MQX Encoder In
031	Binary input DI01	8335		RW	16	
032	Binary input DI02	8336		RO	16	
033	Binary input DI03	8337		RO	16	
034	Binary input DI04	8338		RO	16	
035	Binary input DI05	8339		RO	16	
036	Binary inputs DI00 – DI05	8334		RO	16	
050	Binary output DO00	8843		RW	21	0: No function 21: IPOS output 22: IPOS error
051	Binary output DO01	8350		RW	21	
053	Binary output DO00...	8360		RO		
070	Unit type	8301		RO		
076	Firmware basic unit	8300		RO		
090	PD configuration	8451		RO		
091	Fieldbus type	8452		RO		
092	Fieldbus baud rate	8453		RO		
093	Fieldbus address	8454		RO		
094	PO1 setpoint	8455		RO		
095	PO2 setpoint	8456		RO		
096	PO3 setpoint	8457		RO		
097	PI1 actual value	8458		RO		
098	PI2 actual value	8459		RO		
099	PI3 actual value	8460		RO		
504	Encoder monitoring	8832		RW	1	0: OFF 1: ON
608	Binary input DI00	8844		RW	16	0: No function 16: IPOS input 32: MQX Encoder In
600	Binary input DI01	8335		RW	16	
601	Binary input DI02	8336		RO	16	
602	Binary input DI03	8337		RO	16	
603	Binary input DI04	8338		RO	16	
604	Binary input DI05	8339		RO	16	
628	Binary output DO00	8843		RW	21	0: No function 21: IPOS output 22: IPOS error
620	Binary output DO01	8350		RW	21	
802	Factory setting	8594		R/RW	0	0: No 1: Yes 2: Delivery state
810	RS-485 address	8597		RO	0	
812	RS-485 timeout delay	8599	[s]	RO	1	
819	Fieldbus timeout delay	8606	[s]	RO		



Parameter	Designation	Index	Unit	Access	Default	Meaning / value range
831	Response fieldbus timeout	8610		RW	10	0: No response 10: PO DATA = 0
840	Manual reset	8617		RW		0: OFF 1: ON
870	Setpoint description PO1	8304		RO	12	IPOS PO-DATA
871	Setpoint description PO2	8305		RO	12	IPOS PO-DATA
872	Setpoint description PO3	8306		RO	12	IPOS PO-DATA
873	Actual value description PI1	8307		RO	9	IPOS PI-DATA
874	Actual value description PI2	8308		RO	9	IPOS PI-DATA
875	Actual value description PI3	8309		RO	9	IPOS PI-DATA
-	IPOS control word	8691		RW	0	
-	IPOS program length	8695		RW	0	
-	IPOS variables H0 – H127	11000-11127		RW	–	Memory-resident variable
-	IPOS variable H10 – H511	11010-11511		RW	0	
-	IPOS code	16000-17023		RW	0	



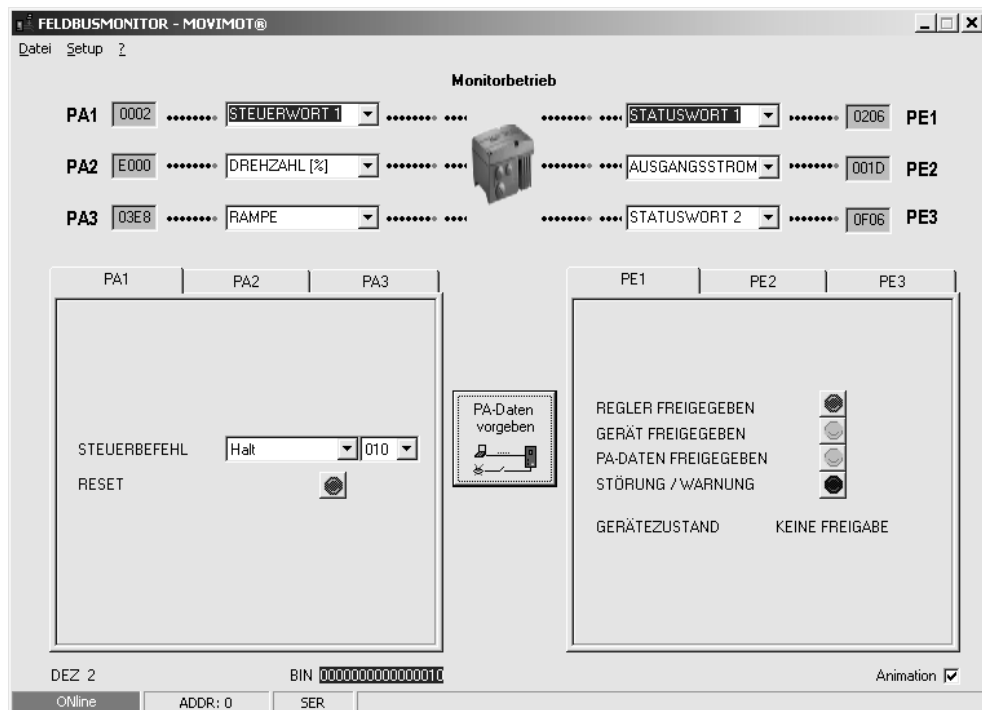
17 Service

	TIP
	For information on service and maintenance of the MOVIMOT® MM..C and D inverters, refer to the respective operating instructions.

17.1 Bus diagnostics with MOVITOOLS®

17.1.1 Fieldbus diagnostics via the MF../MQ.. diagnostic interface

MF../MQ.. fieldbus interfaces are equipped with a diagnostics interface for startup and service. This interface allows for bus diagnostics with the SEW operating software MOVITOOLS®.



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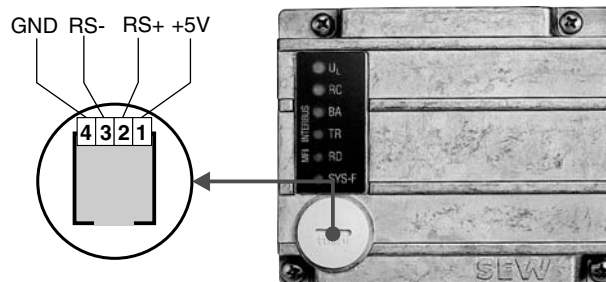
The software offers simple diagnostic functions for setpoint and actual values that are exchanged between the MOVIMOT® drive and the fieldbus master.

	TIP
	The MOVIMOT® drive can be directly controlled in the "Controller" fieldbus monitor operating mode, refer to section "Fieldbus monitor in MOVITOOLS®" (see page 167).

*Structure of the diagnostics interface*

The diagnostics interface is located on potential level 0; the same potential as the module electronics. This applies for all MF../MQ.. fieldbus interfaces. For the MFK.. AS-Interface interfaces, the diagnostics interface is located on the MOVIMOT® potential.

The interface can be accessed via a 4-pin plug connected RJ10. The interface is located underneath the cable gland on the module cover.

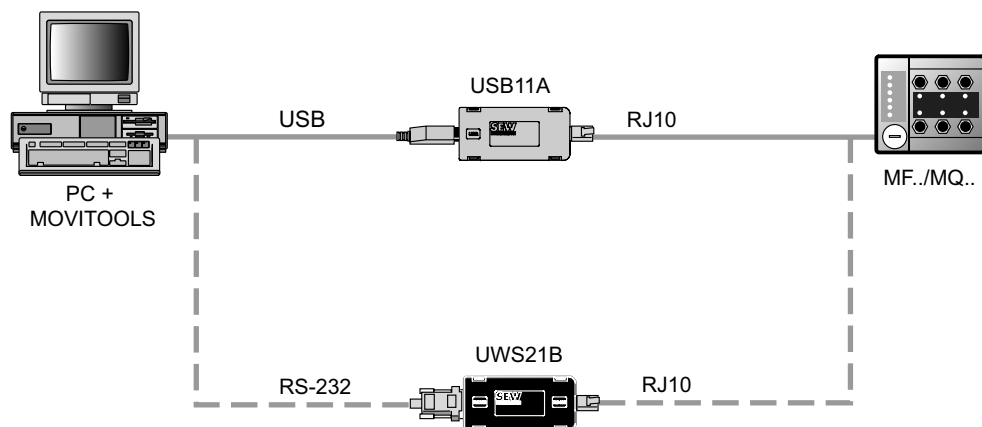


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Interface adapter

The diagnostics interface can be connected to a PC using one of the following options:

- USB11A with USB interface, part number 0 824 831 1
- UWS21B with serial interface RS-232, part number 1 820 456 2



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Scope of delivery:

- Interface adapter
- Cable with RJ10 plug connector
- Interface cable USB (USB11A) or RS-232 (UWS21B)



Relevant diagnostics parameters

The MOVITOOLS® Shell software enables diagnostics for MOVIMOT® drives via the diagnostic interface of the MF.. fieldbus interfaces.

Display values - 00. process values

The MOVIMOT® drive returns the output current as process value.

Menu no.	Parameter name	Index	Meaning/Implementation
004	Output current [% I _N]	8321	MOVIMOT® output current

Display values - 01. status display

The MOVIMOT® status is interpreted and shown in the status display.

Menu no.	Parameter name	Index	Meaning/Implementation
010	Inverter status	8310	MOVIMOT® inverter status
011	Operating state	8310	MOVIMOT® operating state
012	Error status	8310	MOVIMOT® error status

Display values - 04. Binary input option

The digital inputs of the MF.. fieldbus interfaces are shown as optional inputs of the MOVIMOT® drive. Since these inputs do not have a direct effect on the MOVIMOT® drive, the terminal assignment is set to "No function".

Menu no.	Parameter name	Index	Meaning/Implementation
040	Binary inputs DI10	8340	Status of MF.. binary inputs DI0
041	Binary inputs DI11	8341	Status of MF.. binary inputs DI1
042	Binary inputs DI12	8342	Status of MF.. binary inputs DI2
043	Binary inputs DI13	8343	Status of MF.. binary inputs DI3
044	Binary inputs DI14	8344	Status of MF.. binary inputs DI4
045	Binary inputs DI15	8345	Status of MF.. binary inputs DI5
048	Binary inputs DI10 ... DI17	8348	State of all binary inputs

Display values - 06. Binary output option

The digital outputs of the MF.. fieldbus interfaces are shown as optional outputs of the MOVIMOT® drive. Since these outputs do not have a direct effect on the MOVIMOT® drive, the terminal assignment is set to "No function".

Menu no.	Parameter name	Index	Meaning/Implementation
060	Binary outputs DO10	8352	Status of MF.. binary outputs DO0
061	Binary outputs DO11	8353	Status of MF.. binary outputs DO
068	Binary outputs DO10 to DO17	8360	Status of MF.. binary outputs DO0 and DO1



*Display values -
07. unit data*

The unit data displays information on MOVIMOT® and the MF.. fieldbus interface.

Menu no.	Parameter name	Index	Meaning/Implementation
070	Unit type	8301	Unit type MOVIMOT®
072	Option 1	8362	Unit type option 1 = MF.. type
074	Firmware option 1	8364	Firmware part number MF..
076	Firmware basic unit	8300	Firmware part number MOVIMOT®

*Display values -
09. bus diagnostics*

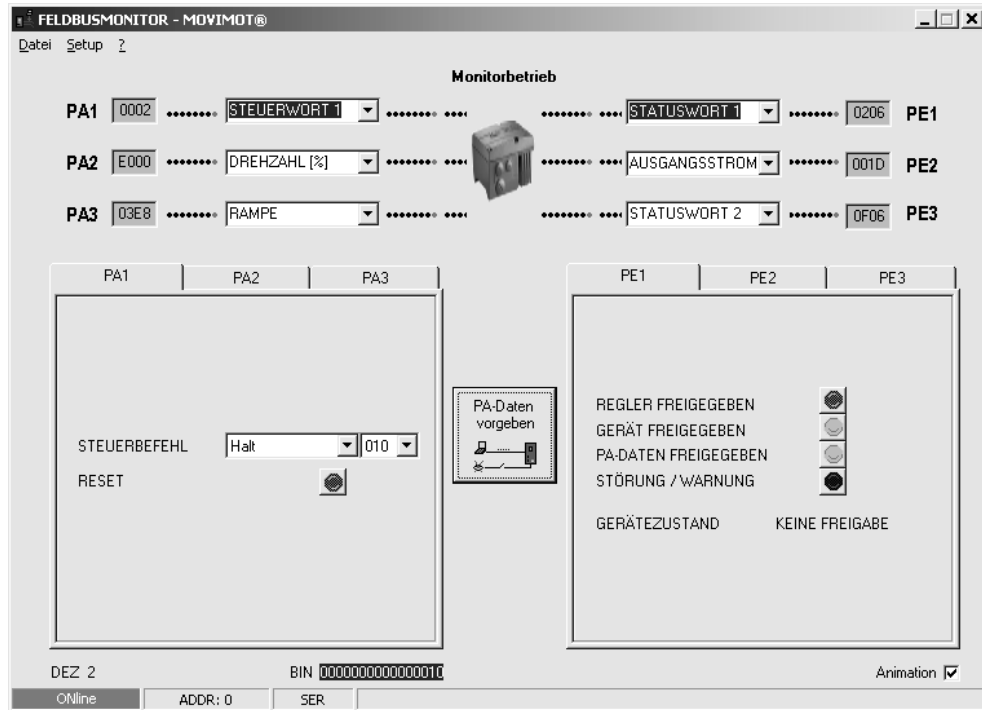
This menu item represents all fieldbus data.

Menu no.	Parameter name	Index	Meaning/Implementation
090	PD configuration	8451	Set PD configuration for MOVIMOT®
091	Fieldbus type	8452	Fieldbus type of MF..
092	Fieldbus baud rate	8453	Baud rate of MF..
093	Fieldbus address	8454	Fieldbus address of MF.. DIP switches
094	PO1 setpoint [hex]	8455	PO1 setpoint from fieldbus master to MOVIMOT®
095	PO2 setpoint [hex]	8456	PO2 setpoint from fieldbus master to MOVIMOT®
096	PO3 setpoint [hex]	8457	PO3 setpoint from fieldbus master to MOVIMOT®
097	PI1 actual value [hex]	8458	PI1 actual value from MOVIMOT® to fieldbus master
098	PI2 actual value [hex]	8459	PI2 actual value from MOVIMOT® to fieldbus master
099	PI3 actual value [hex]	8460	PI3 actual value from MOVIMOT® to fieldbus master



Fieldbus monitor in MOVITOOLS®

The fieldbus monitor in MOVITOOLS® makes for user-friendly control and visualization of cyclical MOVIMOT® process data.



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Characteristics

- Intuitive operation
- Easy to learn control functions even without connection to the fieldbus (preparation for startup)
- Integrated in the SEW user interface software MOVITOOLS®
- Quick and easy troubleshooting
- Shorter project planning phase



Function of the fieldbus monitor

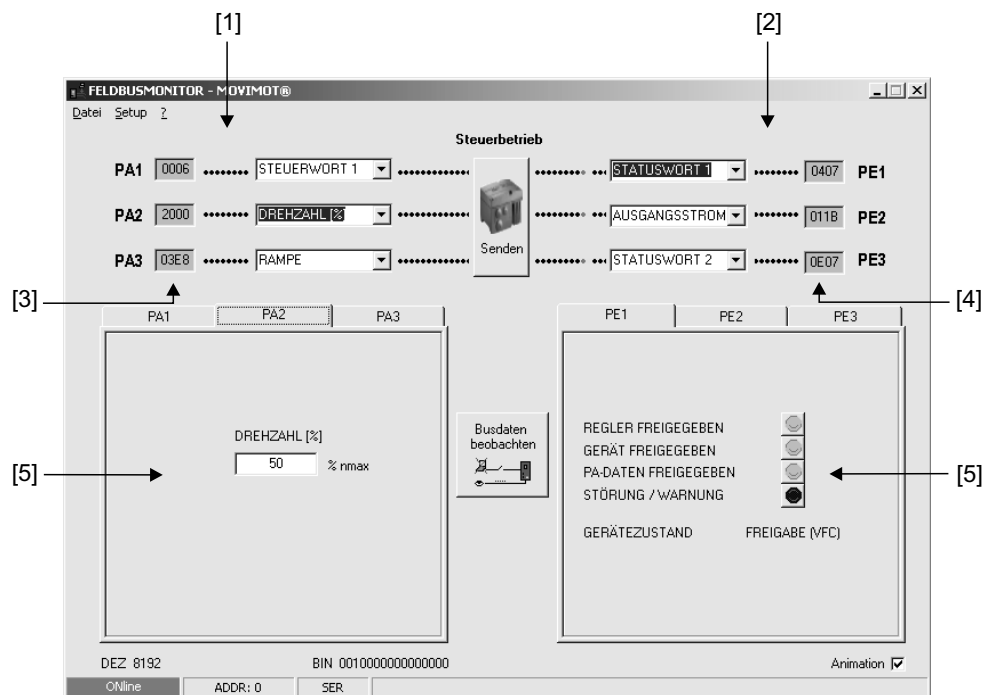
The fieldbus monitor provides the user with a powerful tool for startup and troubleshooting. This tool displays and interprets all cyclical process data exchanged between inverter and control.

The fieldbus monitor lets you monitor the bus operation as a passive station or take active control of the inverter.

This option provides the user with the following possibilities:

- To interactively take over control of the inverter in an existing system and check the functionality of the drive.
- To remotely simulate the operating principle of an individual drive (without existing system and fieldbus master) so that the control functions can be tested prior to startup.

Fieldbus monitor in control mode



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- [1] PO data from controller
- [2] PI data from inverter to controller
- [3] Current HEX values of the process output data (can be edited)
- [4] Current HEX values of the process input data
- [5] Display of current setting



17.1.2 Fieldbus interface error table

Fault code/description	response	Cause	Measure
10 IPOS ILLOP	IPOS program stopped DO = 0	Fault in IPOS program, see IPOS variable H469 for more information	Correct, load and reset IPOS program
14 Encoder fault	Communication to MOVIMOT® stops DO = 0	Interruption of one or both encoder connections	Check the electrical connection between MQ.. and the encoder
17 Stack overflow		Inverter electronics disrupted, possibly due to electromagnetic interference.	- Check grounding and shielding and repair, if necessary - If the error occurs again, contact SEW service.
18 Stack underflow			
19 NMI			
20 Undefined opcode			
21 Protection fault			
22 Illegal word operation and access			
23 Illegal instruction access			
24 Illegal external bus access			
25 EEPROM		Fault while accessing EEPROM	- Activate "Delivery state" settings, perform reset and set parameters again (Important: The IPOS program is deleted) - If the fault occurs again, contact SEW service
28 Fieldbus timeout	Process output data = 0 DO = 0 (can be switched off)	No communication between master and slave within the projected response monitoring.	Check communications routine of the master
32 IPOS index overflow	IPOS program stopped DO = 0	Programming principles violated leading to system internal stack overflow	Check IPOS user program and correct if necessary
37 Watchdog error	Communication to MOVIMOT® stops DO = 0	Error during execution of system software	Consult SEW Service
41 Watchdog option		IPOS watchdog, IPOS program execution time is longer than set watchdog time	Check what time interval has been set in the "_WdOn()" command.
45 Initialization fault		Error after self-test during reset	Perform a reset; if the error occurs again, contact SEW service.
77 Invalid IPOS control value	IPOS program stopped DO = 0	An attempt was made to set an invalid automatic mode.	Check write values of external controller
83 Short circuit output	none	DO0, DO1 or the voltage supply of the VO24 sensors is shorted.	Check the cabling/load of the DO0 and DO1 outputs as well as the voltage supplies of the sensors.
91 System fault	None	One or more stations (MOVIMOT®) could not be addressed by the MQ.. within the timeout interval.	- Check voltage supply and RS-485 wiring - Check address of configured stations
97 Copy data	Communication to MOVIMOT® stops DO = 0	Error occurred when data set was being copied Data is not consistent.	Try to copy the data again; reset the unit to the factory setting "Delivery state" first.



17.2 Extended storage

If a unit with inverter is being stored for a long time, connect it to the mains voltage for at least 5 minutes every 2 years. Otherwise, the unit's service life may be reduced.

17.3 Procedure when maintenance has been neglected

Electrolytic capacitors are used in the inverters. They are subject to aging effects when de-energized. This effect can damage the capacitors if the unit is connected using the rated voltage after a longer period of storage.

If you have not performed maintenance regularly, SEW-EURODRIVE recommends that you increase the line voltage slowly up to the maximum voltage. This can be done, for example, by using a variable transformer for which the output voltage has been set according to the following overview. After you have completed the regeneration process, the unit can be used immediately or stored again for an extended period with maintenance.

The following stages are recommended:

AC 400/500 V units:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 500 V for 1 hour

17.4 Disposal

This product consists of:

- Iron
- Aluminum
- Copper
- Plastic
- Electronic components

Dispose of all components in accordance with applicable regulations.



18 Technical Data

18.1 MFI21, MFI22, MFI32 INTERBUS interface (copper line)

MFI electrical specification	
MFI electronics power supply	$V = +24\text{ V} \pm 25\%$, $I_E \leq 150\text{ mA}$
Electrical isolation	- Floating INTERBUS connection - Between logic and 24 V supply voltage - Between logic and peripherals/MOVIMOT® via opto-coupler
Bus connection technology	Five cage clamp terminals each for incoming and outgoing bus cables
Shielding	via EMC metal cable glands
Binary inputs (sensors)	PLC-compatible according to EN 61131-2 (digital inputs type 1), $R_i \approx 3.0\text{ k}\Omega$, Sampling interval about 5 ms
Signal level	15 V – +30 V "1" = contact closed / -3 V – +5 V "0" = contact open
Sensor supply	DC 24 V to EN 61131-2, interference voltage proof and short-circuit proof
Rated current	$\Sigma 500\text{ mA}$
Internal voltage drop	max. 1 V
Binary outputs (actuators)	PLC-compatible to EN 61131-2, interference-voltage proof and short-circuit proof
Signal level	"0" = 0 V, "1" = 24 V
Rated current	500 mA
Leakage current	max. 0.2 mA
Internal voltage drop	max. 1 V
Line length RS-485	30 m between MFI and MOVIMOT® if installed separately
Ambient temperature	-25 °C – 60 °C
Storage temperature	-25 °C – 85 °C
Degree of protection	IP65 (installed on MFZ.. connection module, all plug connections sealed)
Programming data	
INTERBUS interface	Remote bus and installation remote bus
Protocol mode	Two conductor asynchronous protocol 500 kbaud
ID code	03 _{hex} (03 _{dec}) = Digital module with input and output data
Length code	2 _{hex} / 3 _{hex} / 4 _{hex} depending on the DIP switch setting
Register length on the bus	2, 3 or 4 words (depending on DIP switch setting)
Parameter channel (PCP)	0 words
Data on remote bus interface	
Cable length between 2 MFIs in the remote bus	Typical for INTERBUS, max. 400 m
Maximum number of MFIs on remote bus	Dependent on INTERBUS master 64 (configuration 3 PD + DI/DO) – 128 (configuration 2 PD)
Data on installation remote bus interface	
Cable length between 2 MFIs in the installation remote bus	INTERBUS specific, max. 50 m between first and last station
Maximum number of MFIs on installation remote bus	Limited by the total current consumption (max. 4.5 A) of MFI in installation remote bus line and voltage drop in the last MFI connection



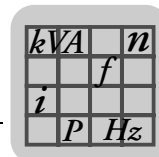
18.2 MQI21, MQI22, MQI32 INTERBUS interface (copper line)

MQI electrical specification	
Power supply to MQI control electronics	$V = +24\text{ V} \pm 25\%$, $I_E \leq 200\text{ mA}$
Electrical isolation	- Floating INTERBUS connection - Between logic and 24 V supply voltage - Between logic and peripherals/MOVIMOT® via opto-coupler
Bus connection technology	Five cage clamp terminals each for incoming and outgoing bus cables
Shielding	via EMC metal cable glands
Binary inputs (sensors)	PLC-compatible according to EN 61131-2 (digital inputs type 1), $R_i \approx 3.0\text{ k}\Omega$, Sampling interval about 5 ms
Signal level	15 V – +30 V "1" = contact closed / -3 V – +5 V "0" = contact open
Sensor supply	DC 24 V to EN 61131-2, interference voltage proof and short-circuit proof
Rated current	$\Sigma 500\text{ mA}$
Internal voltage drop	max. 1 V
Binary outputs (actuators)	PLC-compatible to EN 61131-2, interference-voltage proof and short-circuit proof
Signal level	"0" = 0 V, "1" = 24 V
Rated current	500 mA
Leakage current	max. 0.2 mA
Internal voltage drop	max. 1 V
Line length RS-485	30 m between MQI and MOVIMOT® if installed separately
Ambient temperature	-25 °C – 60 °C
Storage temperature	-25 °C – 85 °C
Degree of protection	IP65 (installed on MFZ.. connection module, all plug connections sealed)

Programming data	
INTERBUS interface	Remote bus and installation remote bus
Protocol mode	Two conductor asynchronous protocol 500 kbaud
ID-Codes	03 _{dec} (03 _{hex}) = Digital module with input and output data 227 _{dec} (E3 _{hex}) = DRIVECOM 1 PCP word 224 _{dec} (E0 _{hex}) = DRIVECOM 2 PCP words 225 _{dec} (E1 _{hex}) = DRIVECOM 4 PCP words Depending on the DIP switch setting
Length code	1 _{hex} to A _{hex} (Depending on DIP switch setting)
Register length on the bus	1 - 10 words (depending on DIP switch setting)
Parameter channel (PCP)	0, 1, 2 or 4 words (depending on the DIP switch setting)
Send telegram length (PCP)	243
Receive telegram length (PCP)	243
Supported services (PCP)	Read, Write, Get OV

Data on remote bus interface	
Cable length between 2 MQIs on the remote bus	INTERBUS typical, max. 400 m
Maximum number of MQIs on remote bus	Dependent on INTERBUS master 25 (configuration 1 PD) to 256 (configuration 0 PD)

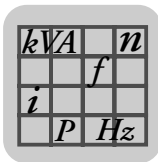
Data on installation remote bus interface	
Cable length between 2 MQIs on the installation remote bus	INTERBUS typical, max. 50 m between first and last station
Maximum number of MQIs on installation remote bus	Limited by the total consumption current (max. 4.5 A) of the MQI in the installation remote bus line and the voltage drop in the last MQI module.



18.3 MFI23, MFI33 INTERBUS interface (fibre optic cable)

MFI23B/33B electrical specification	
MFI electronics power supply	- Bus logic $V_{S1} = 24 V_{DC} \pm 25\%$, $I_E \leq 200 \text{ mA}$ (type. 80 mA) plus supply current for sensors and MOVIMOT® inverter - Actuator voltage $V_{S2} = 24 V_{DC} \pm 25\%$ The two voltages V_{S1} and V_{S2} are daisy-chained and can be used at the plug connection for the next remote bus. The maximum continuous current is: - each max. 16 A at 0 - 40 °C ambient temperature - each max. 10 A at 0 - 55 °C ambient temperature
Electrical isolation	- between bus logic and MOVIMOT® via opto-coupler - between bus logic and binary outputs via opto-coupler - no separation between bus logic and binary inputs
Bus connection technology	Fiber optic rugged-line connector
Binary inputs (sensors)	PLC-compatible according to EN 61131-2 (digital inputs type 1), $R_i \approx 3.0 \text{ k}\Omega$, Sampling interval about 5 ms
Signal level	15 V - +30 V "1" = Contact closed / -3 V...+5 V "0" = Contact open
Sensor supply	From VS1: 24 V _{DC} to EN 61131-2, interference-voltage proof and short-circuit proof
Rated current	Σ 500 mA
Internal voltage drop	max. 1 V
Binary outputs (actuators)	PLC-compatible to EN 61131-2, interference-voltage proof and short-circuit proof
Signal level	"0" = 0 V, "1" = 24 V
Rated current	500 mA
Leakage current	max. 0.2 mA
Internal voltage drop	max. 1 V
Line length RS-485	≤ 30 m between MFI and MOVIMOT®
Ambient temperature	0 °C - 55 °C [max. 10 A continuous current with 24 V voltage loop-through (VS1 and VS2)]
Storage temperature	-25 °C - 85 °C
Degree of protection	IP65 (installed on MFZ.. connection module, all plug connections sealed)
Programming data	
INTERBUS interface	Fiber optic remote bus
Transmission rate	500 kBaud / 2 MBaud
ID code	03 _{hex} (03 _{dec}) = Digital module with input and output data
Length code	2 _{hex} / 3 _{hex} / 4 _{hex} depending on the DIP switch setting
Register length on the bus	2, 3 or 4 words (depending on DIP switch setting)
Parameter channel (PCP)	0 words
Data on INTERBUS interface	
Incoming / outgoing remote bus	Fiber-optic cable (polymer fiber 980/1,000 m)
Connection technology	Fiber optic rugged-line connector
Cable length between 2 MFIs in the bus	max. 50 m, depending on cable type ¹⁾
Maximum number of MFIs on FO remote bus	Dependent on INTERBUS master 64 (configuration 3 PD + DI/DO) – 128 (configuration 2 PD)

1) Cable lengths < 1 m are only permitted with the prefabricated IBS RL CONNECTION-LK special cable bridge from Phoenix Contact



18.4 Field distributors

18.4.1 MF../Z.3., MQ../Z.3. field distributors

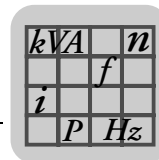
MF../Z.3. MQ../Z.3.	
Ambient temperature	-25 °C - 60 °C
Storage temperature	-25 °C - 85 °C
Degree of protection	IP65 (fieldbus interface and motor connection cable attached and fastened, all plug connections sealed)
Interface	PROFIBUS, INTERBUS, DeviceNet, CANopen, AS-Interface
Permitted motor cable length	max. 30 m (with SEW hybrid cable, type B) If the motor cable cross section is smaller than the supply system lead cross section, note the line fusing!
Weight	about 1.3 kg

18.4.2 MF../Z.6., MQ../Z.6. field distributors

MF../Z.6. MQ../Z.6.	
Maintenance switch	Load interrupter switch and line protection Type: ABB MS 325 - 9 + HK20 Switch activation: black/red, triple lock
Ambient temperature	-25 °C - 55 °C
Storage temperature	-25 °C - 85 °C
Degree of protection	IP65 (fieldbus interface, power supply connection cover and motor connection cable attached and fastened, all plug connections sealed)
Interface	PROFIBUS, INTERBUS, DeviceNet, CANopen, AS-Interface
Permitted motor cable length	max. 30 m (with SEW hybrid cable, type B)
Weight	about 3.6 kg

18.4.3 MF../MM../Z.7., MQ../MM../Z.7. field distributors

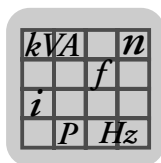
MF../MM../503-00/Z.7. MQ../MM../503-00/Z.7.	
Ambient temperature	-25 °C – 40 °C (P_N reduction: 3% I_N per K to max. 60 °C)
Storage temperature	-25 °C - 85 °C
Degree of protection	IP65 (fieldbus interface, power supply connection cover and motor connection cable attached and fastened, all plug connections sealed)
Interface	PROFIBUS, INTERBUS, DeviceNet, CANopen, AS-Interface
Permitted motor cable length	15 m (with SEW hybrid cable, type A)
Weight	about 3.6 kg



18.4.4 MF../MM../Z.8., MQ../MM../Z.8. field distributors

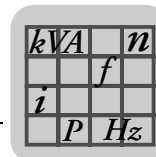
MF../MM../503-00/Z.8. MQ../MM../503-00/Z.8.	
Maintenance switch	Switch disconnecter Type: ABB OT16ET3HS3ST1 Switch activation: black/red, triple lock
Ambient temperature	-25 °C – 40 °C (P_N reduction: 3% I_N per K to max. 55 °C) ¹⁾
Storage temperature	-25 °C - 85 °C
Degree of protection	IP65 (fieldbus interface, power supply connection cover and motor connection cable attached and fastened, all plug connections sealed)
Interface	PROFIBUS, INTERBUS, DeviceNet, CANopen, AS-Interface
Permitted motor cable length	15 m (with SEW hybrid cable, type A)
Weight	Size 1: about 5.2 kg Size 2: about 6.7 kg

1) For MM3XC: -25 °C – 40 °C with S3 25% cdf (to max. 55 °C with S3 10% cdf)



19 Address List

Germany			
Headquarters Production Sales	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal P.O. Box Postfach 3023 • D-76642 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
	Service Competence Center	Central	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf
	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 40-42 D-30823 Garbsen (near Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 sc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 D-08393 Meerane (near Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-30 sc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 D-85551 Kirchheim (near München)	Tel. +49 89 909552-10 Fax +49 89 909552-50 sc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 D-40764 Langenfeld (near Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 sc-west@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 sc-elektronik@sew-eurodrive.de
	Drive Service Hotline / 24 Hour Service		+49 180 5 SEWHELP +49 180 5 7394357
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France			
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Production	Forbach	SEW-EUROCOME Zone Industrielle Technopôle Forbach Sud B. P. 30269 F-57604 Forbach Cedex	Tel. +33 3 87 29 38 00
Assembly Sales Service	Bordeaux	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan - B. P. 182 F-33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
	Paris	SEW-USOCOME Zone industrielle 2, rue Denis Papin F-77390 Verneuil l'Etang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
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	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
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Belarus			
Sales	Minsk	SEW-EURODRIVE BY Rybalko Str. 26 BY-220033 Minsk	Tel. +375 (17) 298 38 50 Fax +375 (17) 29838 50 sales@sew.by
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Service Compe- tence Center	Industrial Gears	SEW Caron-Vector Rue de Parc Industriel, 31 BE-6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be service-wallonie@sew-eurodrive.be
	Antwerp	SEW Caron-Vector Glasstraat, 19 BE-2170 Merksem	Tel. +32 3 64 19 333 Fax +32 3 64 19 336 http://www.sew-eurodrive.be service-antwerpen@sew-eurodrive.be
Brazil			
Production Sales Service	Sao Paulo	SEW-EURODRIVE Brasil Ltda. Avenida Amâncio Gaiolli, 152 - Rodovia Presi- dente Dutra Km 208 Guarulhos - 07251-250 - SP SAT - SEW ATENDE - 0800 7700496	Tel. +55 11 2489-9133 Fax +55 11 2480-3328 http://www.sew-eurodrive.com.br sew@sew.com.br
Additional addresses for service in Brazil provided on request!			
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Cameroon			
Sales	Douala	Electro-Services Rue Drouot Akwa B.P. 2024 Douala	Tel. +237 33 431137 Fax +237 33 431137



Canada			
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	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street Delta, B.C. V4G 1 E2	Tel. +1 604 946-5535 Fax +1 604 946-2513 marketing@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger LaSalle, Quebec H8N 2V9	Tel. +1 514 367-1124 Fax +1 514 367-3677 marketing@sew-eurodrive.ca
	Additional addresses for service in Canada provided on request!		
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Assembly Sales Service	Suzhou	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530	Tel. +86 20 82267890 Fax +86 20 82267891 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan	Tel. +86 27 84478398 Fax +86 27 84478388
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Colombia			
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Service	Sharjah	Copam Middle East (FZC) Sharjah Airport International Free Zone P.O. Box 120709 Sharjah United Arabian Emirates	Tel. +971 6 5578-488 Fax +971 6 5578-499 copam_me@eim.ae
Estonia			
Sales	Tallin	ALAS-KUUL AS Reti tee 4 EE-75301 Peetri küla, Rae vald, Harjumaa	Tel. +372 6593230 Fax +372 6593231 veiko.soots@alas-kuul.ee
Finland			
Assembly Sales Service	Lahti	SEW-EURODRIVE OY Vesimäentie 4 FIN-15860 Hollola 2	Tel. +358 201 589-300 Fax +358 3 780-6211 sew@sew.fi http://www.sew-eurodrive.fi
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Sales	Libreville	ESG Electro Services Gabun Feu Rouge Lalala 1889 Libreville Gabun	Tel. +241 741059 Fax +241 741059
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Assembly Sales Service	Normanton	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No.1 GB-Normanton, West- Yorkshire WF6 1QR	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
Greece			
Sales Service	Athen	Christ. Boznos & Son S.A. 12, Mavromichali Street P.O. Box 80136, GR-18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
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Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 c.v.shivkumar@seweurodriveindia.com
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Sales Service	Dublin	Alpert Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 info@alpert.ie http://www.alpert.ie
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Sales	Tel-Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milano	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano)	Tel. +39 02 96 9801 Fax +39 02 96 799781 http://www.sew-eurodrive.it sewit@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SICA Ste industrielle et commerciale pour l'Afrique 165, Bld de Marseille B.P. 2323, Abidjan 08	Tel. +225 2579-44 Fax +225 2584-36
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp
Korea			
Assembly Sales Service	Ansan-City	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate 1048-4, Shingil-Dong Ansan 425-120	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-korea.co.kr master@sew-korea.co.kr
	Busan	SEW-EURODRIVE KOREA Co., Ltd. No. 1720 - 11, Songjeong - dong Gangseo-ku Busan 618-270	Tel. +82 51 832-0204 Fax +82 51 832-0230 master@sew-korea.co.kr
Latvia			
Sales	Riga	SIA Alas-Kuul Katlakalna 11C LV-1073 Riga	Tel. +371 7139253 Fax +371 7139386 http://www.alas-kuul.com info@alas-kuul.com



Lebanon			
Sales	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 4947-86 +961 1 4982-72 +961 3 2745-39 Fax +961 1 4949-71 ssacar@inco.com.lb
Lithuania			
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Luxembourg			
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Mexico			
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Netherlands			
Assembly Sales Service	Rotterdam	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 http://www.vector.nu info@vector.nu
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	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferryroad Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
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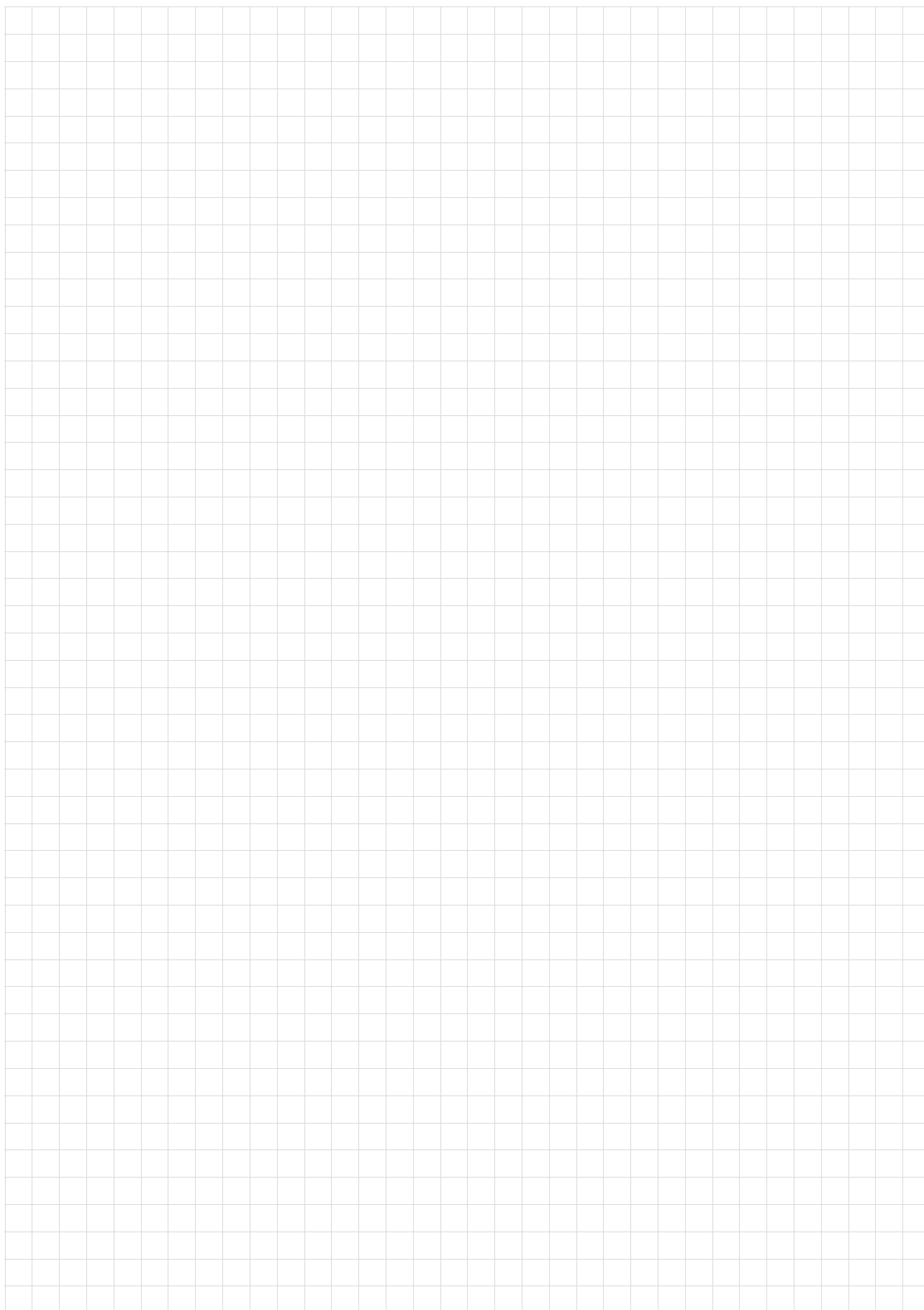
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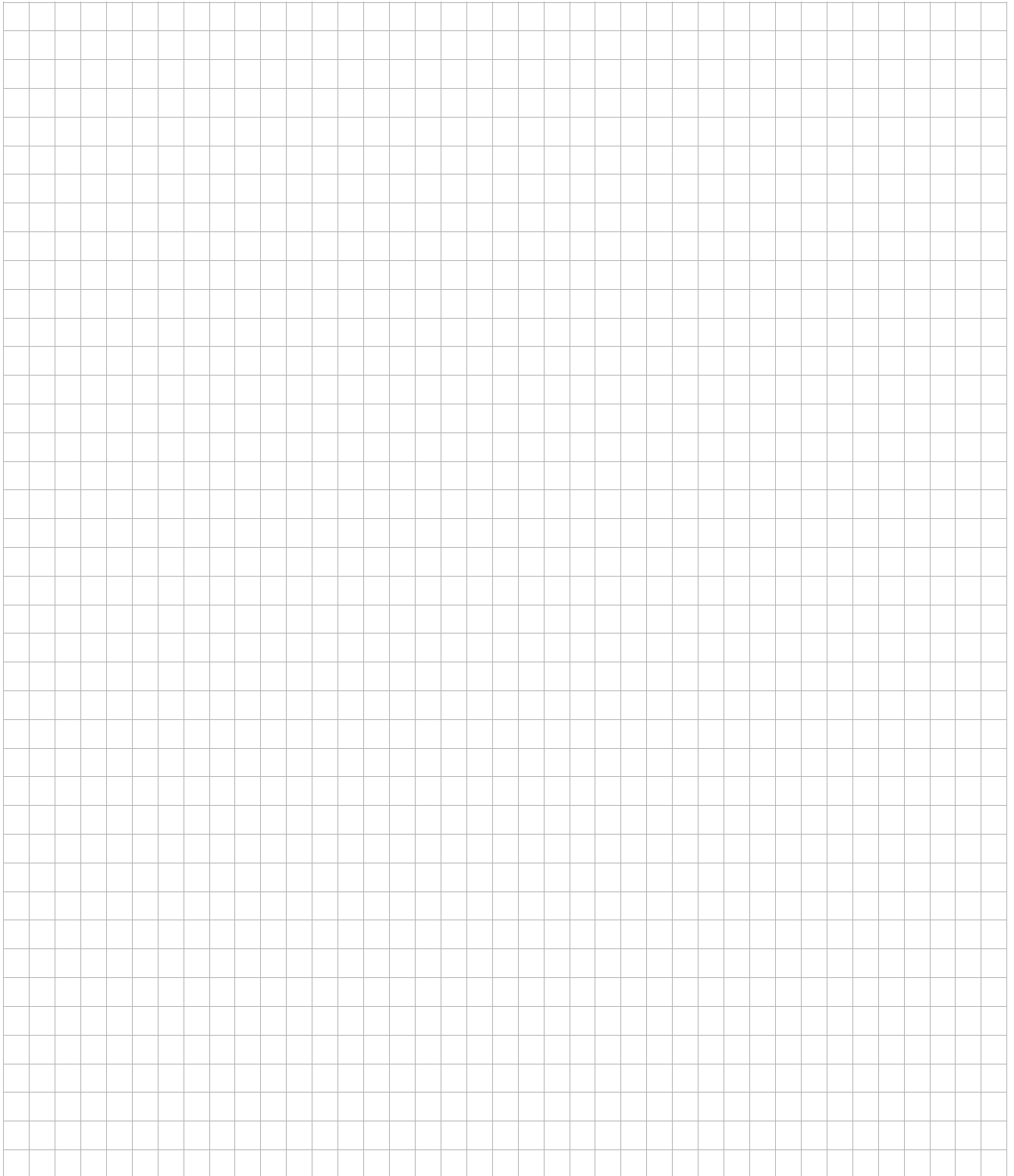


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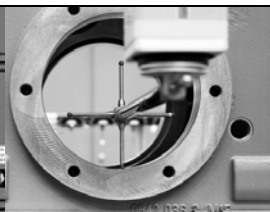
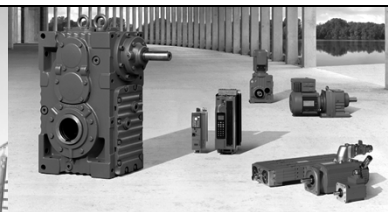
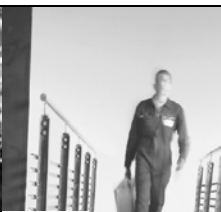
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